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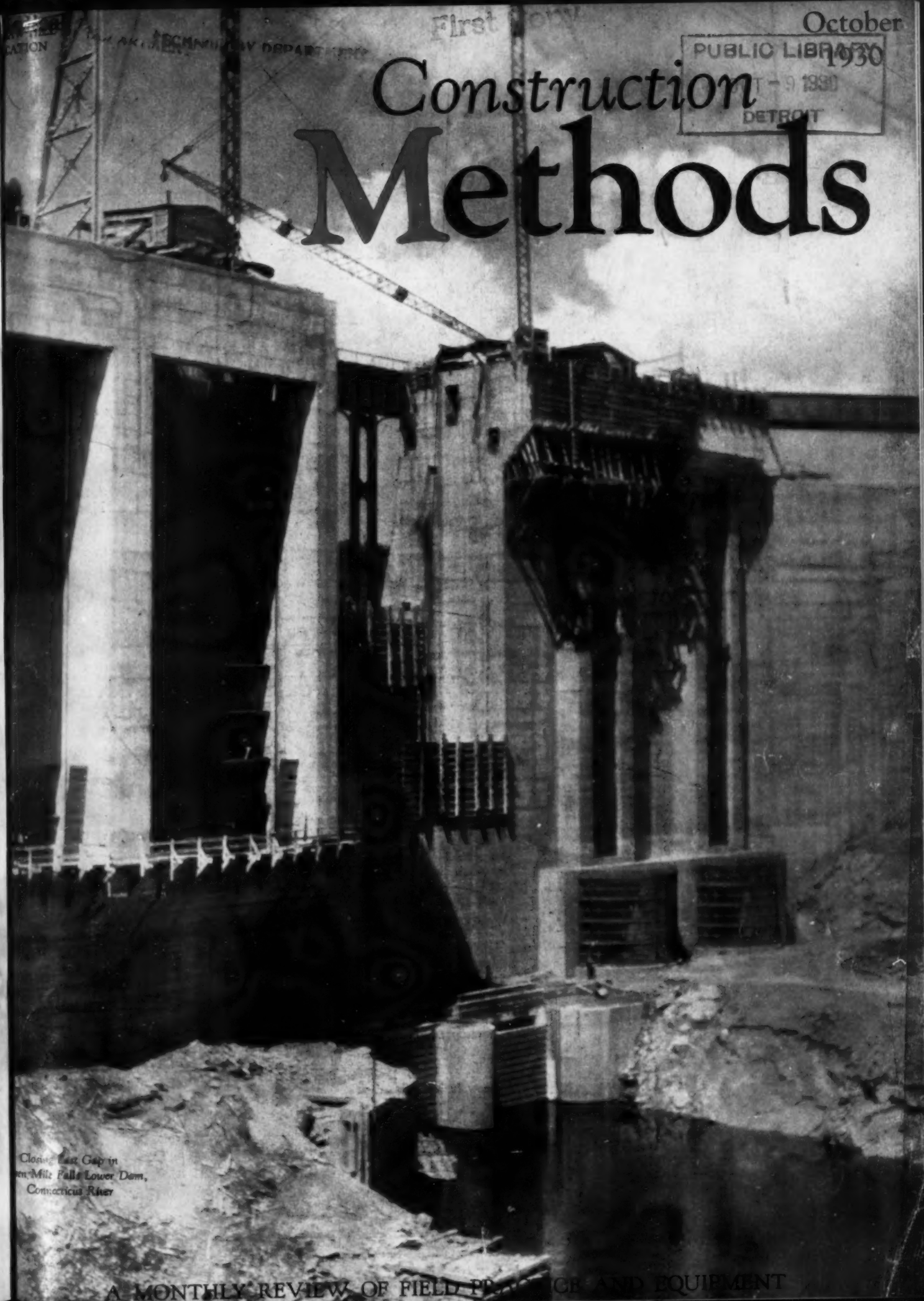
October 1930

Construction Methods



Closing Last Gap in Enfield Falls Lower Dam, Connecticut River

A MONTHLY REVIEW OF FIELD PRACTICE AND EQUIPMENT

A MAINTAINER

that . . .

- ***Removes***
  Chatter Bumps Easily.

- ***Leaves***
  A Smooth Accurately Graded Road.

- ***Gives***
  The Operator Quick, Easy and Positive Control.

- ***Pushes***
  Operating and Maintenance Costs to a New Low Level.

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Here Are The Features That Give The Galion Its Superiority

For removing chatter bumps from your earth, stone, gravel, or retread roads, you can select no better equipment than the Galion Multiple-Blade Road Maintainer. It hitches to any power unit—operated by power unit operator.

Seven blades, total length forty feet, work surface four times in one trip. Standard cut is 9 ft. wide; with blade extensions 10½ or 12 ft. Blades rigidly bolted to main frame which is made of 6" heavy ship channel steel securely bolted and welded to cross members.

Operation is through a single control wheel which operates the equalizing spring type lifts. Control wheel is adjustable both in height and distance from the operator.

Pressure on blades can be varied at will between zero and approximately 4000 lbs. Gears shifted by pushing or pulling control wheel — lift both front and rear in one operation or either end separately.

Maximum road clearance of blades is 12 inches — greater clearance than provided by any other maintainer.

Both front and rear axles are one piece cold drawn steel. Rear axle has simple, easily adjusted road crowning device on each side.

Front and rear wheels are identical in design and size — interchangeable to compensate for wear. Equipped with roller bearings and 4 inch rubber tires. Write now for complete data.

The Galion Iron Works & Mfg. Co.

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TECHNOLOGY DEPT.

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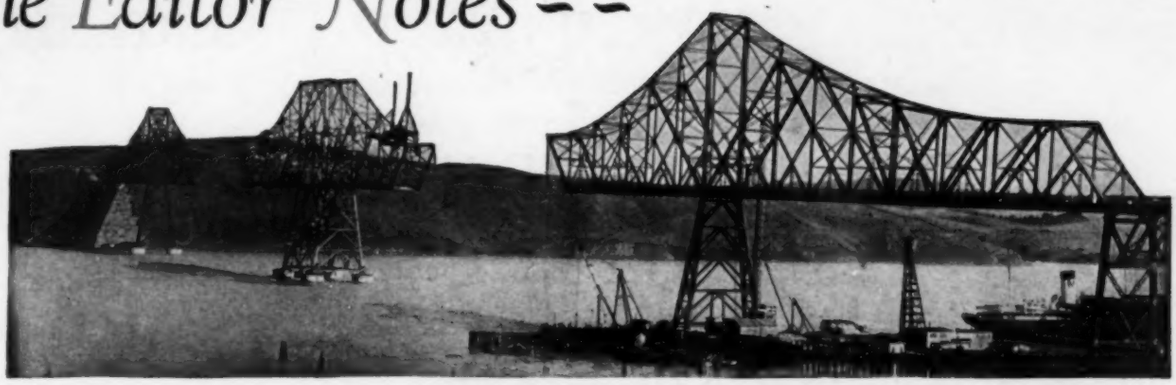
The Editor Notes - -



What Price Traffic Through the Job?

WHAT allowance must be made for the increase in road construction cost caused by maintaining traffic through the job? Contractors generally agree that the extra cost, exclusive of the expense of policemen or telephones, runs between 10 and 20 per cent, averaging about 15 per cent. It is a cost which the contractor must include in his bid and which the public must eventually pay.

Both in thickly-populated states, where closing a road means inconvenience to many, and in thinly-peopled areas, where detours are not available, it is impractical to divert traffic from a highway during reconstruction. Maintaining traffic through the job usually means travel in one direction at a time. One-way traffic, moving alternately in opposite directions, requires policemen to control it. The efficiency of this control can have a marked effect on the increase in construction cost.

Much as the concession may be opposed by some road builders, honest thinkers will concede that when a highway is open to traffic its main business is to carry the traffic as efficiently as possible. This theory would require control of traffic by the state, county, or other civil government having jurisdiction over the road. Some states act on this theory, putting their own officers on the job to direct all traffic. The plan does not work much to the contractor's disadvantage, as the policemen usually give privileges to the job trucks.

Other states have the contractor handle the traffic on his job, including a unit bid for this service in the contract. Policemen, paid by the contractor, are usually sworn in as deputy sheriffs or constables. On concrete paving jobs bids for this item range upward from 1 cent per linear foot of half-width slab. An average price probably would be about 10 cents.

A third method, followed in some states, requires the contractor to pay all expenses of policemen, telephone systems, etc., and later to be reimbursed by the state.

The last two plans would seem to give the contractor a decided advantage in having complete control of the policemen and traffic on his job. In practice, however, this advantage is not so apparent. Policemen employed by the state do just as thorough and just as considerate a job as those paid by the contractor.

The cost of maintaining traffic is eventually the same, whether paid by the state directly or included in the contract. More important than this expense is the increase in cost of construction. In as much as this increase is probably no greater when state policemen handle traffic, it would seem proper to leave the traffic function in the control of directly-appointed public agents. In any event, the contractor must realize that traffic through the job increases costs and should be provided for in his bid prices.

CONSTRUCTION METHODS

A monthly review of modern construction practice and equipment

ROBERT K. TOMLIN, *Editor*

Editorial Staff

VINCENT B. SMITH NELLE FITZGERALD
J. I. BALLARD (San Francisco)

WILLARD CHEVALIER, *Publishing Director*

A McGraw-Hill Publication
Tenth Avenue at 36th Street, New York

Subway Pile-Driving

The Marcus Contracting Co., Inc., not Spencer, White & Prentis, drove the pre-test piles illustrated on p. *41* of the article "Building New York's Subways" appearing in *Construction Methods* last month. The Marcus company states that Spencer, White & Prentis acted as consulting engineers, that their pre-test patented method was used but that all of the piles were driven by the Marcus company.

Metal Base for Brick Pavement

GREAT interest attaches to an experiment in road design undertaken last month in Sangamon County (near Springfield) Illinois. A short test section of highway has been built in which the novelty is the use on the subgrade of a metal base of rust-resisting ingot iron sheets supporting a brick surface with asphaltic joint filler. Several variations in the design of the metal base are being tried, including blue annealed flat sheets ¼ in. thick and galvanized corrugated sheets of No. 10 gage. The object of the experiments is to produce a subgrade that will insure a smooth, durable top surface. Further details of this innovation in road building will appear in an early issue of *Construction Methods*.

The Time to Build is Now

Under the foregoing head the H. K. Ferguson Co., engineers and contractors, of Cleveland, lists a number of specific reasons to show why owners may secure bargains in new buildings by awarding contracts for construction now. Among them are the following: (1) Lowest material prices in ten years. (2) Plenty of willing, efficient labor. (3) Pick of engineering talent available. (4) Ample time, under present conditions, for thorough study and development. (5) Money cheap and looking for sound investments. (6) Business upswing due. (7) Quick delivery.

It is pointed out as a general principle that the best time for a construction project is during the readjustment period or the early part of the period of expansion.

The construction organization which isn't making capital of these points among prospective clients is passing up opportunities for developing new business.

Pictures that Tell a Story

"NOT just a paper full of pictures, but rather a practical and usable description of modern construction methods, told in vivid and interesting pictures rather than through the written word."

It was the editor of *Construction Methods* speaking; he was defining the editorial objective of his new paper. Since that day in 1926, he has bent all his study and energy to the realization of that purpose. And that is why *"Methods"* has achieved in four short years so distinctive a place in industrial journalism.

The task was not easy; new trails had to be blazed. Ordinary, casual job-pictures would not do. The story-telling pictures he needed were not readily available. No selection from a pile of ready-made prints, no snipping of handy shears, no convenient paste-pot could produce the paper he had planned. It was evident that it was not a desk job.

So *"Methods"* has had to develop a new tcehnique of pictorial description that is just as essential and as fundamental as the grammar and rhetoric of the writer. It has had to plan its stories just as carefully as do the workers in words, it has had to go out into the field with its cameras and sketch-books to track the men and methods of construction through their day's work, and then it has had to learn how to describe them to its readers through skillfully planned picture-stories that get the big point across with the aid of the fewest words.

That is why *Construction Methods* is not regarded to day as just a "picture paper." That is why it is accepted as an *authoritative journal of construction methods,* informing, instructing and suggesting through carefully planned pictorial presentation, what is best in modern construction practice.

Willard Chevalier
Publishing Director

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- Used alone for film coating, or in conjunction with fabric membranes for built-up membrane protection.
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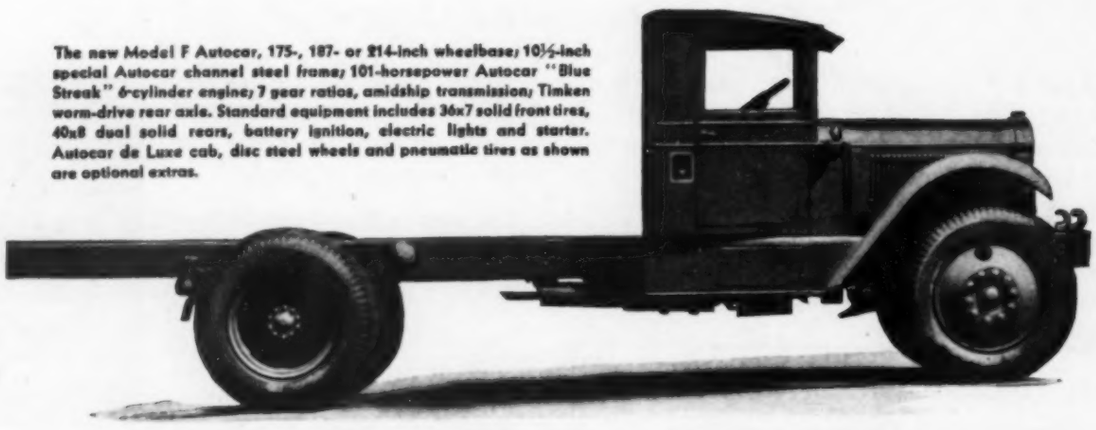

The new Model F Autocar, 175-, 187- or 214-inch wheelbase; 10½-inch special Autocar channel steel frame; 101-horsepower Autocar "Blue Streak" 6-cylinder engine; 7 gear ratios, amidship transmission; Timken worm-drive rear axle. Standard equipment includes 36x7 solid front tires, 40x8 dual solid rears, battery ignition, electric lights and starter. Autocar de Luxe cab, disc steel wheels and pneumatic tires as shown are optional extras.

Decrease Your Costs With This Autocar Heavy-Duty Dump Chassis

No motor truck is better able to meet the relentless strains of construction load and dump work than the rugged new Model F Autocar.

Model F is the chassis specifically engineered for heaviest-duty dump service. It is powered, of course, with the Autocar "Blue Streak" 6-cylinder engine, which develops 101 horsepower at 2400 r. p. m. It will handle any load, up to the capacity of its tires. Capacity and performance are made possible by its 10½-inch special Autocar channel steel frame, its sturdy 7-speed amidship type transmission, Timken worm-drive rear axle, and 4-wheel brakes with booster. Wheelbase lengths are 175, 187 or 214 inches.

Model F can step 32 miles per hour under full load. Write for complete details on the many remarkable features that make it the gem of the construction man's ultra-heavy-duty squadron.

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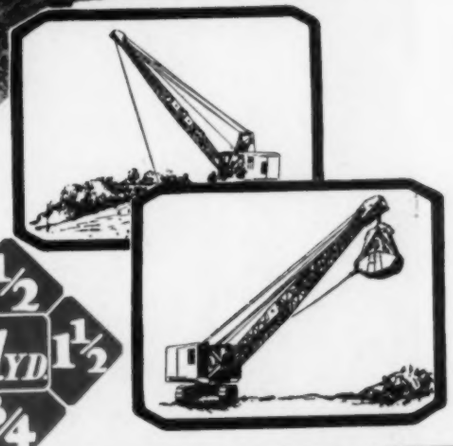

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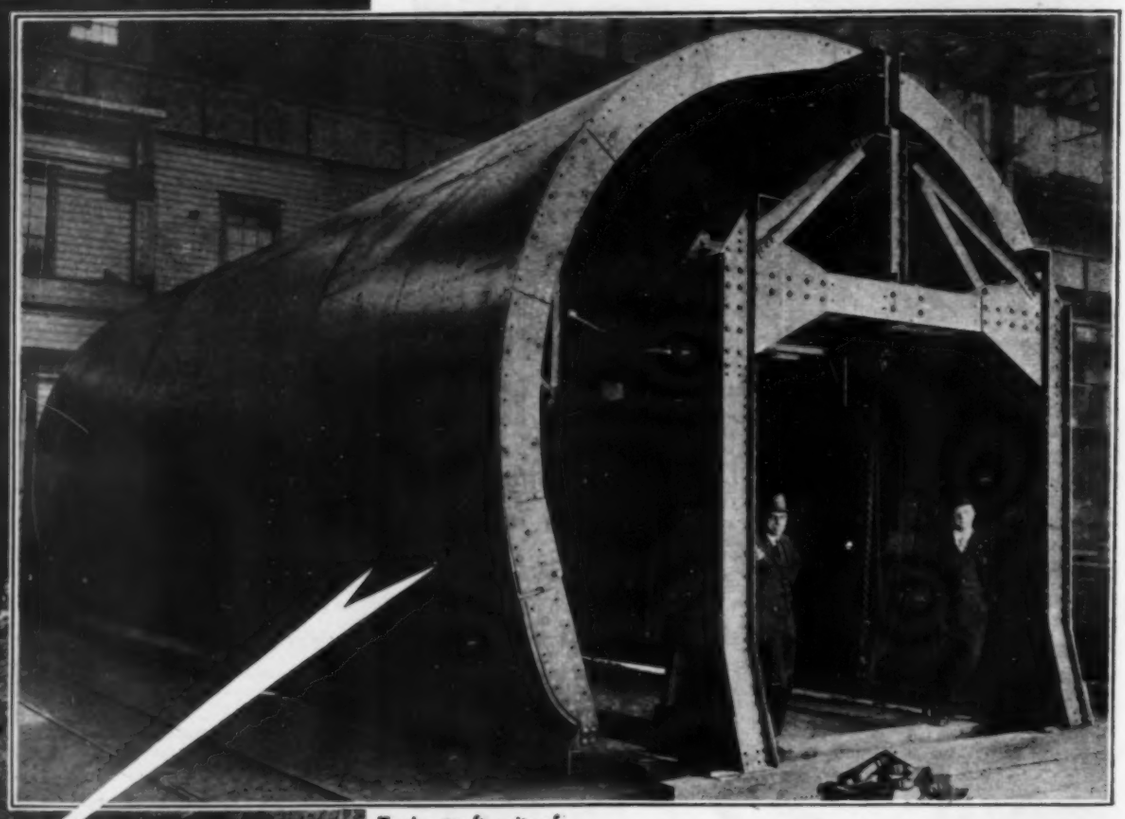
STEEL FORMS *for the Mantaro Tunnel ....in Peru*



Twelve 20 ft. units of Steel Forms, and two 40 ft. travelers, were furnished. The travelers were designed with ample clearance to permit the passage of muck trains.

A river in Peru—the Mantaro—is to be harnessed to supply power for the mining operations of the Cerro de Pasco Copper Corporation.

A. Guthrie & Company of St. Paul, Minn., engaged to do the job, will simplify tunnel lining operations with the huge Blaw-Knox Traveling and Collapsible STEEL FORM shown above—being shop tested before shipment.

The STEEL FORM experience of Blaw-Knox is gained from twenty-three years of world-wide contact with concreting operations—*it is available to you.*

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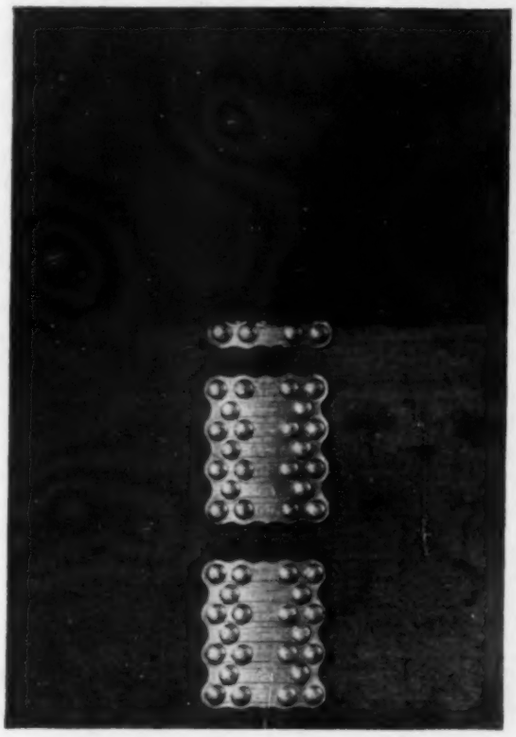

Actual Photo Showing
COVULC Applied to Belt Joint

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WILL TRIPLE THE LIFE OF THE OLD ONE!

COVULC will put a *new surface* on an old conveyor belt at a fraction of what it costs to buy a new one. And two of the largest gravel companies and iron works in the East—(names on request)—inform us that surfaces they have repaired with COVULC have given *three times the wear* afforded by the original surface.

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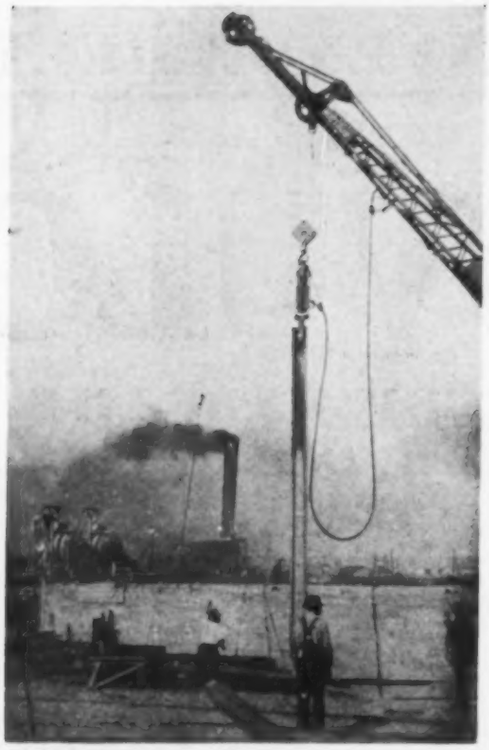

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A hammer must not apply the driving impact at too high a velocity. Neither must it be too light in weight.

A light weight of ram at high velocity results in bruising and shattering the head of the pile instead of driving it into the ground. The energy of the blow is absorbed within the pile before it has opportunity to begin to move downward.

The Warrington-Vulcan Hammer has always been distinguished by its unique principle of "a heavy ram striking the pile with low velocity." This type of design, as embodied in the Warrington-Vulcan Hammer, delivers a blow of the proper *character* for real driving.

In addition to this principle Warrington-Vulcan Pile Hammers are noted for their excellent construction throughout. A simple, positively-actuated valve gear; a quick-acting and wide-opening exhaust; piston forged integrally with rod, are some of the other features.

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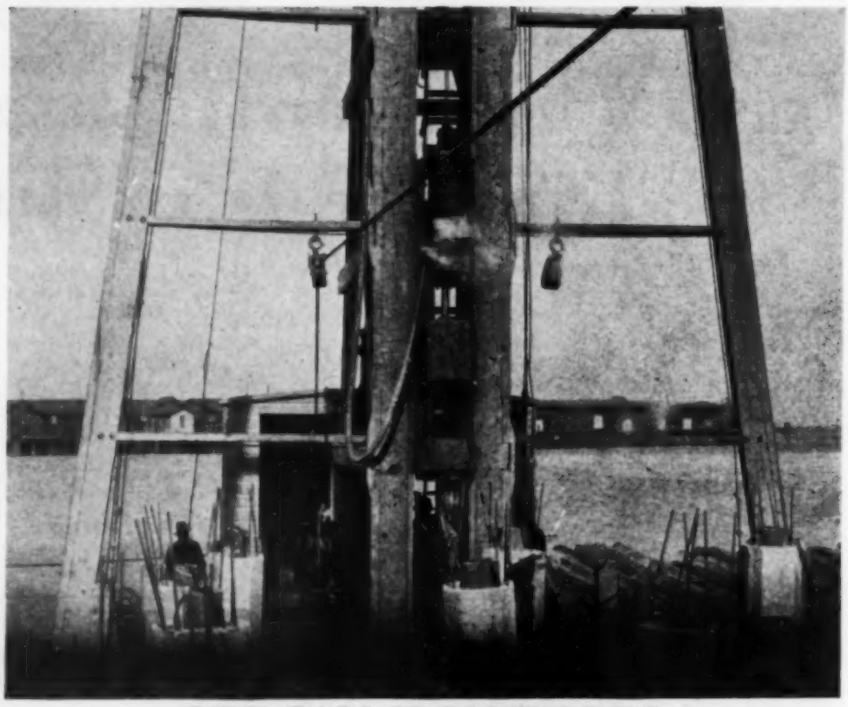
It is, therefore, always ready. Picked up on the crane hook and attached to pile, it is then ready to pound out the pile.

The Vulcan Extractor is built in three sizes. Write for descriptive Bulletin.



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3. Complete steering control from operator's position.
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5. Transmission and swing reversing gears and all gears below deck enclosed and running in oil.
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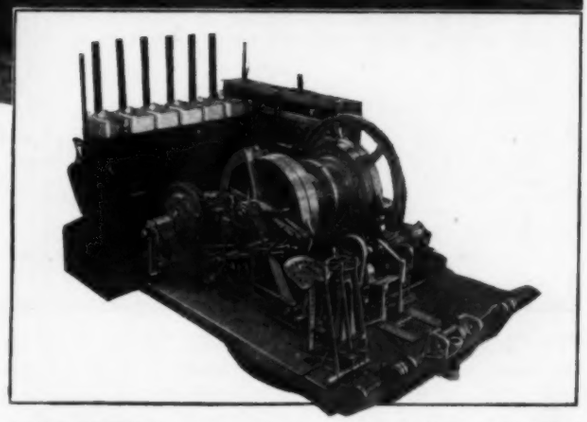

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Some famous du

and the uses to which they are adapted

(A handy chart well

USES	"B" BLASTING POWDER	DUROX	DU PONT EXTRA	RED CROSS EXTRA
Clay Mining (Open)	1st Deep Sprung Holes	1st	2nd D-H	1st
Clay Mining (Underground)	3rd	1st	2nd D-H	2nd 20%-40%
Excavating for Foundations	2nd Deep Sprung Holes Clay and Shale	2nd	3rd	1st 20%-40%
Gypsum Mining	0	2nd	3rd	2nd
Open Pit Mining	1st Deep Sprung Holes Soft Material	2nd	?	1st 20%-60%
Ore Mining (Underground)	0	3rd	2nd	2nd
Quarrying	2nd Tunnel Blasts	2nd Soft Limestone	1st Shale and Soft Limestone	1st Shale and Soft Limestone Also Tunnel Blasts
Roads and Railroads	1st Deep Sprung Holes Soft Material	?	?	1st 20%-60%
Salt Mining	0	1st	1st	3rd
Tunnels and Drifts	0	0	?	3rd

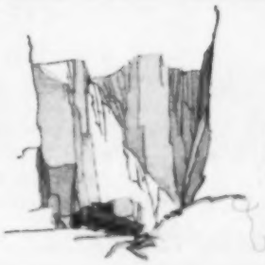
1st, 2nd, 3rd, 4th—Order of preference. 0—Should never be used.

The chart shown above is designed to help you select explosives which will give the best results in proportion to costs. Eight well-known du Pont explosives . . . and the chief kinds of blasting to which they are adapted . . . are given in the table. There are other du Pont explosives that can be used for some of the blasting work mentioned, but these eight give an excellent coverage for the particular fields.

When you specify du Pont explosives for the jobs you undertake, you specify explosives into whose making has gone more than a century and a quarter of experience. With du Pont explosives you are assured of satisfactory execution. For each du Pont explosive has been made, after thorough chemical research and study, to do the most efficient work in the blasting operation for which it is intended.

E. I. DU PONT DE NEMOURS & CO., Inc. ***Explosives***

DU PONT
REG. U. S. PAT. OFF.



DU PONT
REG. U. S. PAT. OFF.

Pont explosives

other than coal mining and agriculture worth your saving)

DU PONT GELATIN	DU PONT SPECIAL GELATIN	DU PONT QUARRY GELATIN	STRAIGHT DYNAMITE
?	?	?	?
?	?	0	?
2nd Rock Only	2nd Rock Only	2nd Rock Only	3rd Rock
1st–20%	1st–35%	0	1st–20% L. D.
?	3rd Wet Holes	3rd Wet Holes	3rd
1st	1st	0	4th
2nd Granite and Hard Limestone	2nd Granite and Hard Limestone	1st Granite and Hard Limestone	2nd Granite and Hard Limestone
2nd Very Hard Rock Only	2nd Very Hard Rock Only	1st Very Hard Rock Only	3rd
4th	?	?	?
1st	1st	0	?

?—Can be used but is not recommended.

DU PONT
REG. U.S. PAT. OFF.

Department **WILMINGTON, DEL.**

Quick facts about these eight du Pont explosives

♦

"B" BLASTING POWDER. A deflagrating explosive made in seven standard granulations, of uniform size grains, and the railroad granulation which is a mixture of several sizes of grains. In material to which blasting powder is adapted it is probably the most economical explosive to use. Can be used only in dry work as it is readily affected by water.

♦

DUROX. An ammonia dynamite of low density and high velocity. Fumes are good. Its high cartridge count . . . 160 sticks to the case . . . makes it economical to use. Suited for blasting salt, limestone and gypsum.

♦

DU PONT EXTRA DYNAMITE. Low-density ammonia dynamite. Made in five types, all of them the same weight strength but varying in density and bulk strength. Strengths from 20% to 55%. Fumes are less objectionable than Red Cross Extra.

♦

RED CROSS EXTRA DYNAMITE. Probably the most popular high explosive on the market. Made in strengths from 15% to 60%. 102 to 106 sticks to the case.

♦

DU PONT GELATIN. Especially adapted for close work where ventilation is poor. Gives minimum of obnoxious fumes. Highly water resistant. Is plastic and loads solidly in bore holes.

♦

DU PONT SPECIAL GELATIN is similar in most respects to du Pont Gelatin except that it is not quite so water resisting and not adapted for very wet work. Its fumes have a different flavor from du Pont Gelatin, but are no more obnoxious.

♦

DU PONT QUARRY GELATIN. A type of gelatin dynamite developed especially for open work where the nature of the fumes is not important. It has same density, plasticity and water-resisting qualities as regular gelatins . . . and is stronger, grade for grade. Cannot be used in close work. Excellent for all kinds of outside work.

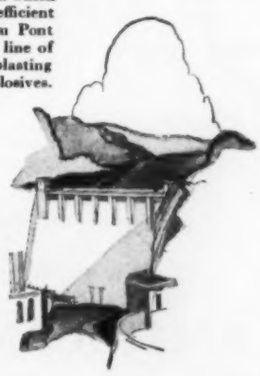
♦

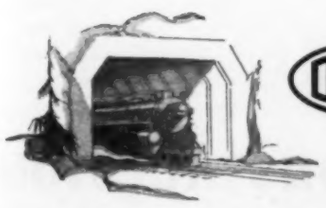
DU PONT STRAIGHT DYNAMITE. The type of high explosive from which all others are graded. Is the quickest acting and most sensitive of them all, is highly water resistant and is the best explosive for mudcapping and propagated shots. It is not adapted for use in sprung holes owing to its sensitiveness, nor in close work, as its fumes, especially in the higher grades, are likely to be too obnoxious.

All above explosives are low freezing

♦

BLASTING ACCESSORIES. To fire the different explosives in the great variety of ways in which they are loaded requires efficient blasting accessories. The du Pont Company makes a complete line of these. Specify du Pont blasting accessories when you order explosives.



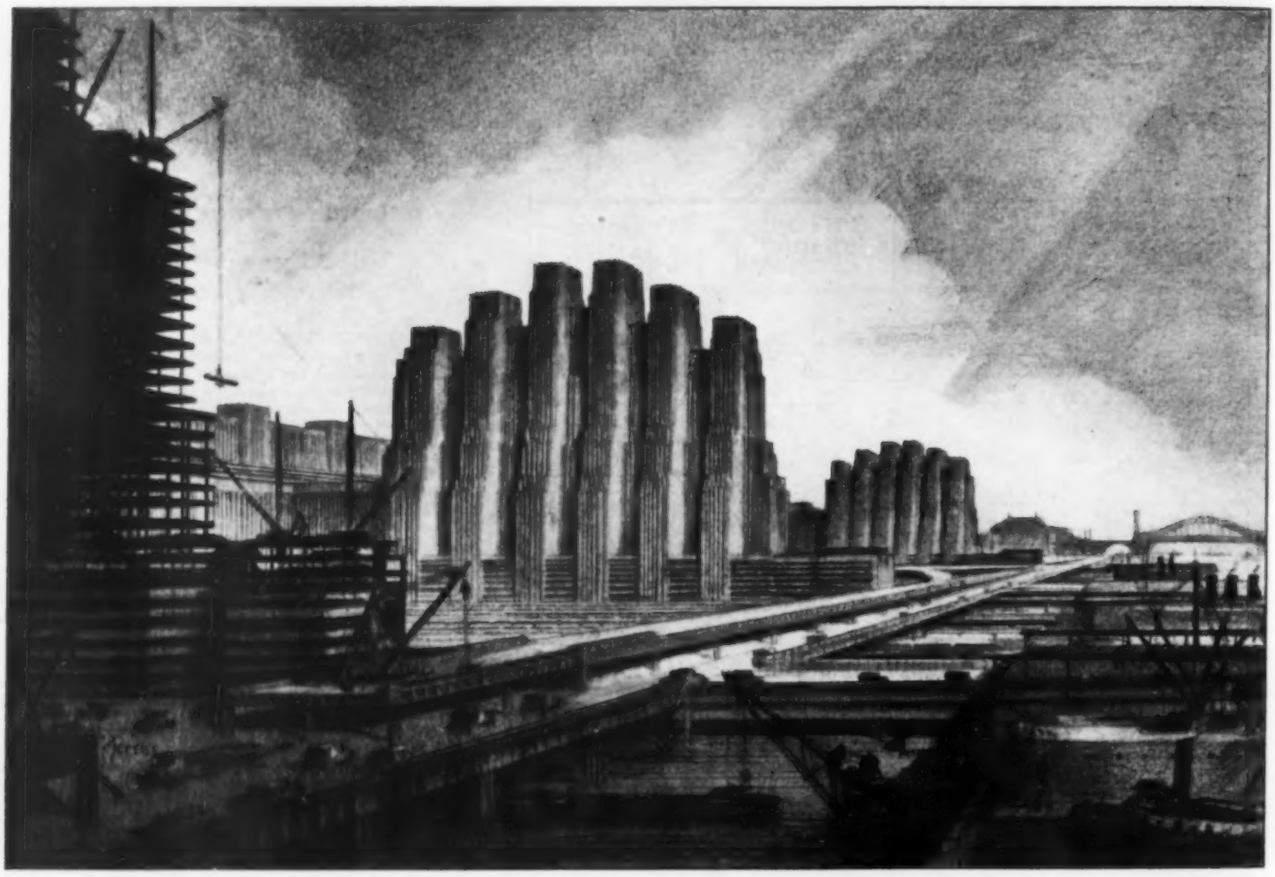


DU PONT
REG. U. S. PAT. OFF.

DU PONT
REG. U. S. PAT. OFF.

STRUCTURAL STEEL CREATED THE SKYSCRAPER

THE TIDE OF STEEL RISES FAST



"STEEL SEAPORT"—IMAGINATIVE DESIGN BY HUGH FERRISS. AN ENLARGEMENT, ON SPECIAL STOCK FOR FRAMING, WILL BE MAILED WITHOUT CHARGE TO ANY ARCHITECT, ENGINEER OR BUSINESS EXECUTIVE.

STEEL bears the burdens of the sea . . . facilitates the handling, storage and distribution of cargoes ashore. The same safe metal that makes worthy ships and mighty cranes carries railroads and highways over and under congested city streets, leaps deep gorges, lifts priceless floor-space to the skies. . . . And on this swiftly rising tide of steel, progress rides!

As the matchless strength, adaptability, permanence and economy of steel become common knowledge, there is increasing demand for its use in structures of every kind and size. To homes, schools, apartment and mercantile houses, to industrial plants and small as well as large bridges, steel brings those identical qualities which make possible the most amazing structures the world has ever seen.

Structural steel will not shrink, rot, crack or deteriorate with age. It is fire-safe, fool-proof. It comes to a job ready to go into place. It is quickly erected in any weather, any climate.

Before building anything, find out what steel can do for you. The Institute serves as a clearing house for technical and economic information on structural steel, and offers full and free co-operation in the use of such data to architects, engineers and all others interested.

The co-operative non-profit service organization of the structural steel industry of North America. Through its extensive test and research program, the Institute aims to establish the full facts regarding steel in relation to every type of construction. The Institute's many publications, covering every phase of steel construction, are available on request. Please address all inquiries to 200 Madison Avenue, New York City. Canadian address: 710 Bank of Hamilton Bldg., Toronto, Ontario. District offices in New York, Worcester, Philadelphia, Birmingham, Cleveland, Chicago, Milwaukee, St. Louis, Topeka, Dallas, San Francisco and Toronto.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION

STEEL INSURES STRENGTH AND SECURITY

"HERCULES"

RED-STRAND

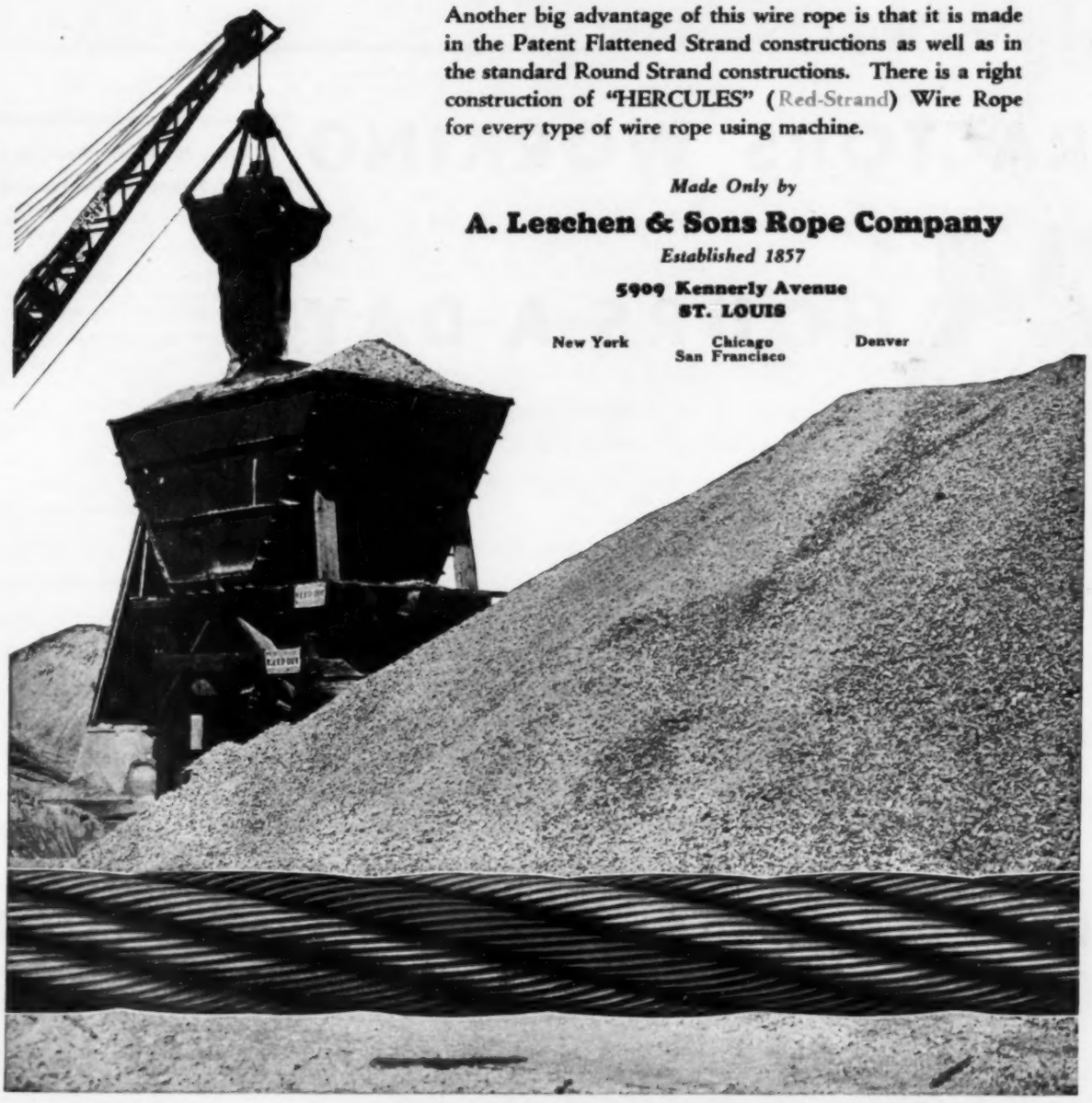
REG. U.S. PAT. OFF.

WIRE ROPE

A TRUE measure of value is "the amount of service that an article gives for each dollar of its cost," and this is the yard-stick that we would like to have you apply to "HERCULES" (Red-Strand) Wire Rope.

"HERCULES" is an economical wire rope because it possesses in proper balance and to a correct degree, all of the qualities that hard work requires.

Another big advantage of this wire rope is that it is made in the Patent Flattened Strand constructions as well as in the standard Round Strand constructions. There is a right construction of "HERCULES" (Red-Strand) Wire Rope for every type of wire rope using machine.



Made Only by

A. Leschen & Sons Rope Company

Established 1857

5909 Kennerly Avenue
ST. LOUIS

New York Chicago San Francisco Denver

LINN TRACTORS ON ANOTHER HYDRO-ELECTRIC PROJECT

One of a fleet of fourteen Linn Tractors purchased by the Central Maine Power Co. of Augusta, Maine. They are being used in moving the 2,500,000 cubic yards of dirt involved in constructing the Wyman Dam at Bingham, Maine.

14 LINN TRACTORS WORKING 24 HOURS A DAY

Only the Linn Offers You All These Advantages

1. *Patented Flexible Traction that* grips any surface under all weather conditions.
2. Tremendous hauling power—100 horsepower to take full advantage of Linn Traction.
3. Ten ton capacity on its own chassis.
4. Extra traction and power for additional tow loads.
5. Easy on men—steers like a truck.
6. Four speeds forward with four speeds reverse optional.

Fourteen Linn tractors working twenty-four hours a day are speeding the completion of the Great Wyman Dam designed to develop 105,000 horsepower.

To stand the gaff of this Herculean labor is a tribute to Linn's exclusive basic design and great chassis strength. To carry a full ten ton pay load under every and all conditions means more than giant power of the engine. It means traction that utilizes every foot pound of energy transmitted from the engine. Linn roller chain assembly transfers the entire weight, distributing it evenly over the full area of the ground contact of its patented flexible traction. There are no weight carrying axles or axle bearings and the traction members of 12 per cent manganese steel—non-clogging, non-slipping, grow harder with use.

Get the recorded facts of Linn low cost per pay load ton mile, on all heavy duty difficult work.

LAFRANCE REPUBLIC LINN TRACTORS

LINN MANUFACTURING CORPORATION

Division of LaFRANCE-REPUBLIC Corporation

Manufacturers of American La-France Trucks, Linn Tractors, Republic Trucks

Factories: Alma, Mich. • Morris, New York

Patent No. 1,570,521
Patent No. 1,521,454
Patent No. 1,685,041
Patent No. 1,685,070
Patent No. 1,704,979
Other Patents Pending

Represented in:

New York City	Boston	Philadelphia	Chicago	Tulsa, Okla.	Salt Lake City	San Francisco
Skowhegan, Maine	Charlotte, N. C.	Pittsburgh	St. Louis	Omaha, Nebr.	Denver	Portland, Ore.
New Haven, Conn.	Memphis, Tenn.	Louisville, Ky.	Kansas City, Mo.	Sioux Falls, S. D.	Jerome, Ariz.	Spokane
Baltimore	Johnson City, Tenn.	Detroit	Little Rock, Ark.	St. Paul, Minn.	Los Angeles	

105 direct distributors located throughout the United States and 49 distributors located in 30 foreign countries

Canadian Linn Distributors: Mussens Limited, Montreal

BIGGS ELECTRICALLY WELDED STEEL PIPE

The City of Detroit installs 24,000 feet of 72 in. diameter Biggs electrically welded steel pipe for Contract No. 1929-1. The J. A. Mercier-Brandon Company, contractors.

Mercier-Brandon, Detroit, installs 24,000 feet of 72 in. Biggs electrically welded steel pipe. Photograph taken on Ilene Avenue near Fenkell.

OMER BRANDON, Treasurer of the J. A. Mercier-Brandon Company, writes as follows in regard to his experience with Biggs Welded Pipe on this job:

"We have been very well pleased with the pipe that you have furnished.

"The specials checked very accurately. On this 24,000 foot job, we made tests approximately every 2000 or 2500 feet and in all of these tests the leakage was way below the allowable, the average running about 35% to 50%.

"We experienced no leakage nor difficulty of any kind in connection with any of the welded shop seams. In fact, your welded joints held up 100 per cent and the tests, as you know, were quite severe. This was quite important in view of the fact that the trench at different times reached a depth of 25 to 26 feet, and repairing of shop work would have been extremely expensive."

That sort of expert preparation is the rule with Biggs Pipe. No wonder Biggs Welded Pipe, 30 in. diameter and larger, is being used more and more on large projects like this one. And it's only down-in-the-ditch installations, and plenty of them, that make Biggs Pipe the most preferred and actually the cheapest in the end for the contractor to install.

Unless you get such service, initial price means nothing. . . . May we work with *you* on the next project in *your* territory?

View on Ilene Avenue near Fenkell, Detroit, also showing the Mercier-Brandon job. Mr. Brandon in foreground.

Biggs Builds

The same close and accurate attention to detail runs through all products built by Biggs, noteworthy among which are the following:

Welded Steel Pipe
Riveted Steel Pipe
Tunnel Shields
Caissons
Pontoons
Air Locks
Welded Tanks
Riveted Tanks
General Steel Plate Work

Biggs Automatically Welded Steel Pipe Is Thoroughly Reliable

Biggs has furnished electrically welded steel pipe on 15 major projects ranging from 30 in. diameter to 78 in. diameter and in plate thickness from $\frac{1}{4}$ in. to $\frac{1}{2}$ in. The 100% joint efficiency of the Biggs weld, painstaking care in the shop fabrication of specials, a fine attention to every detail, and prompt service, have demonstrated time and time again the advantages of working with Biggs.

THE BIGGS BOILER WORKS COMPANY, Akron, Ohio

New York Detroit

BIGGS Steel Pipe *Riveted and Welded*

BOILER WORKS CO. The Biggs EST 1857 AKRON OHIO

Copyright 1930 by The Biggs Boiler Works Company, Akron, Ohio.

MASSIVE IN SIZE
GREAT IN STRENGTH
Easy to Handle and Surefooted

The Wehr "A" Series with your choice of Four Power Plants . . . *the World's most efficient Center Control Grader!*

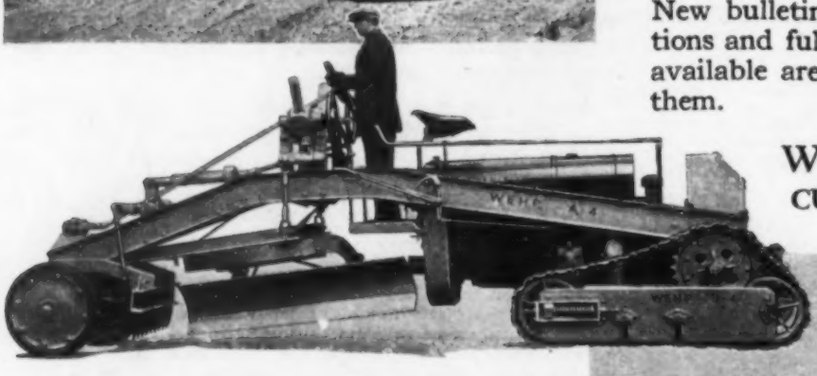
Never before in the history of power grader construction has there been a center control grader to compare with the new series "A"!

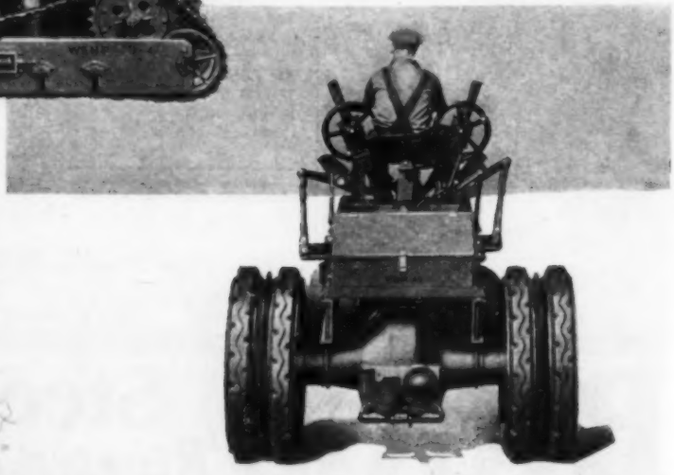
Big, strong, easy to handle and capable of the toughest job—this new series "A" can be supplied with any one of four highly efficient power plants—and, with either Wehr All-Purpose Wheels or Wehr "J" series crawlers.

This new center control job has all the original exclusive Wehr features, plus many new features which are the result of constant research and development by Wehr engineers.

New bulletins containing complete specifications and full data regarding all power plants available are yours upon request. Write for them.

WEHR COMPANY
CUDAHY, WISCONSIN





From every angle, front, side or rear, rugged construction and power to "do the job" are outstandingly apparent. There is no going too rough or job too tough for the Wehr.

WEHR
POWER GRADER

We comb the country

.... *for this scarce and costly metal!*

TO THE EYE ... MERELY SCRAP ... an unsightly, tangled mass of metal. Yet we have to shop the country over to find it!

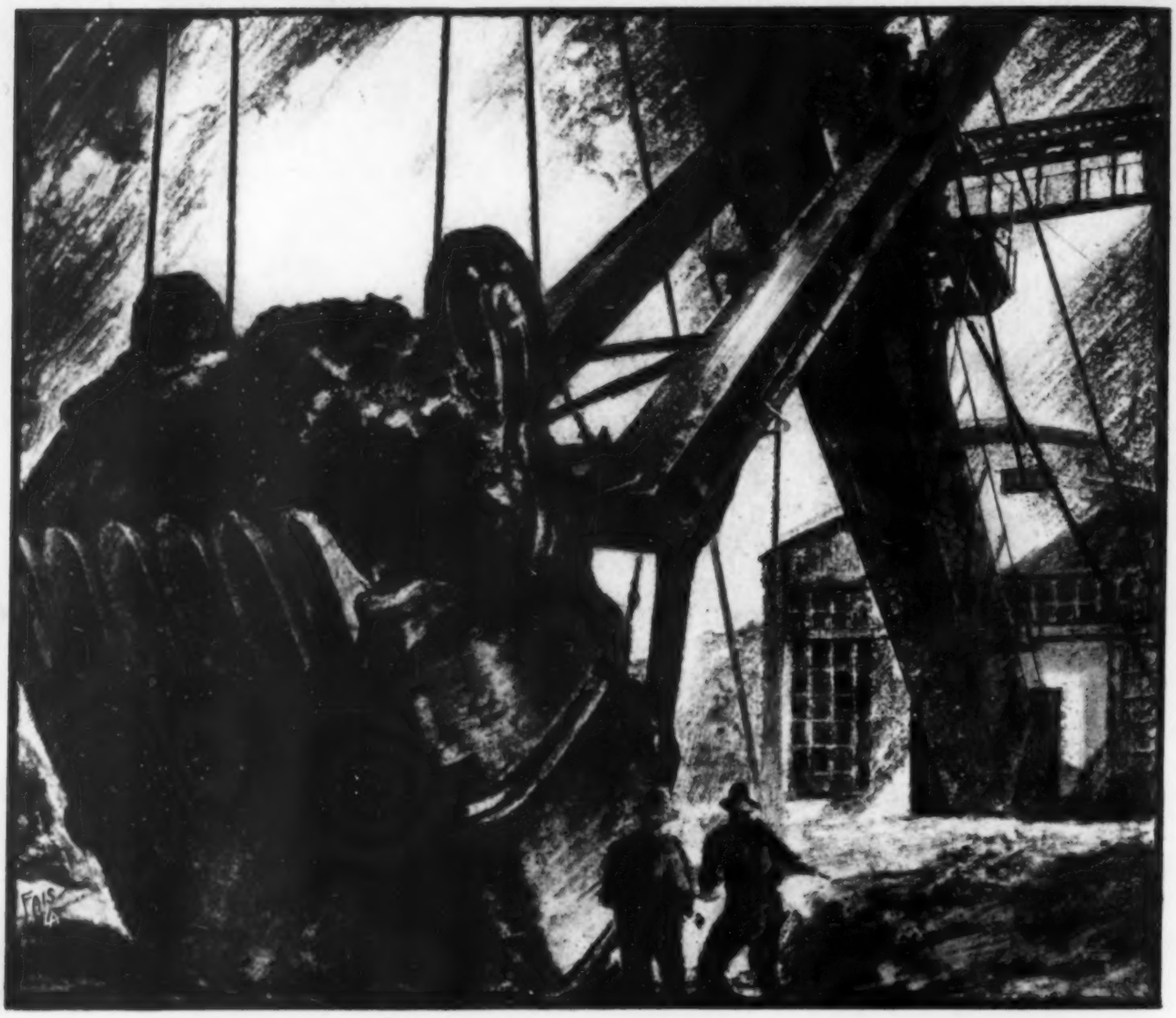
It is one of the several materials used in making acid steel for Roebling "Blue Center" Steel Wire Rope ... and is the purest low phosphorus melting stock obtainable ... scarce ... expensive.

We spend a lot of time searching for this costly metal ... and in analyzing it. We also exercise an extraordinary amount of care in selecting other melting stock ... the purest of acid open hearth pig, of ore, and of fuel ... likewise scarce and expensive ingredients.

It takes more time and patience ... this old-fashioned thoroughness ... this close attention to details. *But it produces Roebling Wire Rope!*

ROEBLING **WIRE ROPE**

"BLUE CENTER" STEEL



A Colossus . . . *Roebling equipped!*

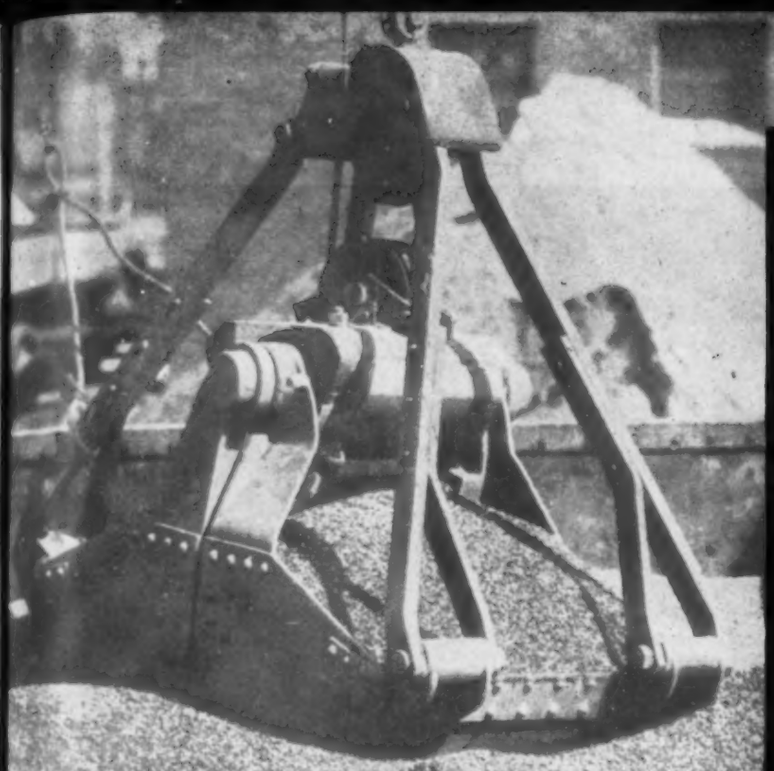
THIS huge shovel of the Pittsburgh and Midway Coal Mining Company is one of the country's giants. 16 cubic yards is the capacity of its dipper! In rigging this shovel, only a rope whose mettle was beyond suspicion could be considered. And the choice of its makers was Roebling "Blue Center" Steel Wire Rope. ¶ There are many sound reasons for the confidence placed in Roebling Rope. Its production is controlled with scrupulous care every step of the way, from furnace to shipping room. Old-fashioned thoroughness prevails throughout the Roebling mills — it is the creed of every department.

JOHN A. ROEBLING'S SONS COMPANY

WIRE . . . WIRE ROPE . . . WELDING WIRE . . . FLAT WIRE
COPPER *and* INSULATED WIRES AND CABLES
TRENTON, N.J. *Branches in Principal Cities*

ROEBLING **WIRE ROPE**

"BLUE CENTER" STEEL



Why an Owen Stays Rigid

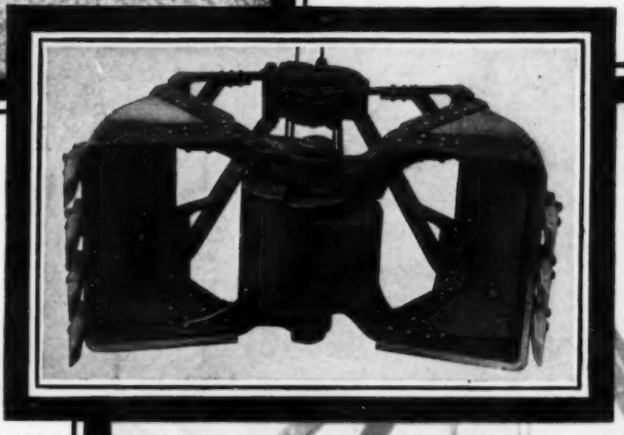
ALL RACK, wobble and side play are eliminated from the upper structure of an Owen Bucket. The one-piece steel crosshead and the four arms are constructed in the form of a "Double A" frame.

The upper arm connections are rigid: pinned in the crosshead on one side, and keyed to a long bolt which extends through a bushing in the crosshead on the other side.

The bottom arm ends are also keyed to bolts which turn in case hardened steel bushings. Thus wear and play of arms is prevented.

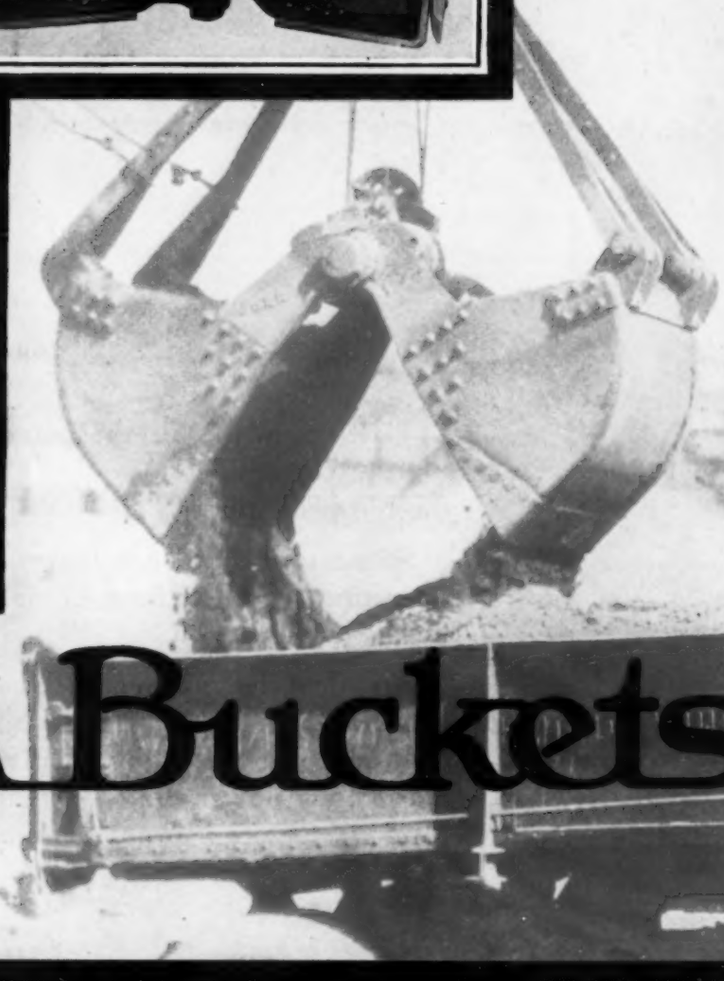
Write for a folder explaining and illustrating all of the Owen 17 Points of Leadership.

THE OWEN BUCKET CO.
6023 Breakwater Avenue
Cleveland, Ohio



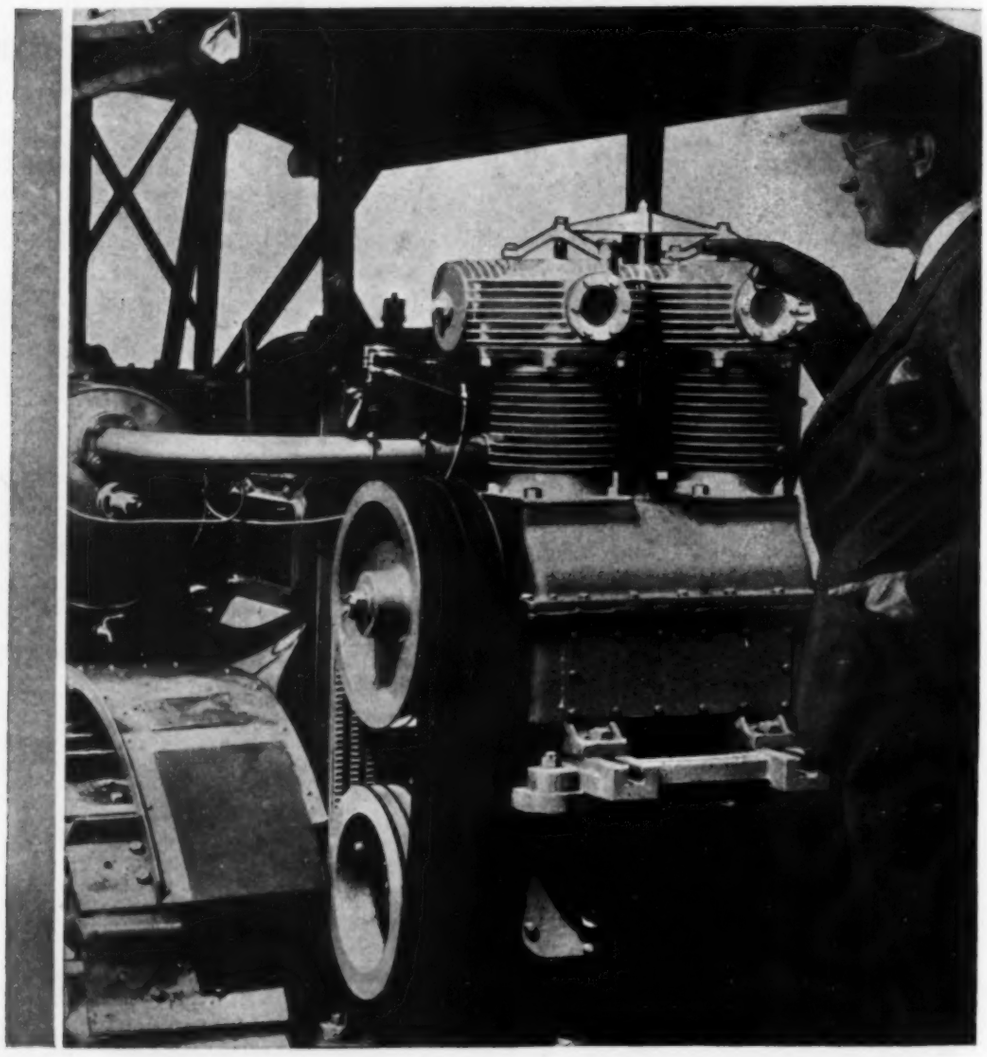
17 POINTS OF LEADERSHIP

1. One-piece steel crosshead.
2. No wear in upper or lower arm ends.
3. Heavy high carbon steel arms.
4. Adjustable undiminished closing power.
5. Long life to sheaves and cable.
6. Long arm bolt bearings sealed from grit.
7. Lever type steel arm brackets.
8. Closing cable is protected against excessive wear.
9. Heavy shock-resisting renewable lips.
10. Cable clips eliminated.
11. Sealed center shaft bearings.
12. Greater digging power with no dead weight.
13. Penetration and clean dumping.
14. Dropping shocks absorbed, eliminating breakage.
15. Rigid shell construction.
16. Heavy duty high carbon drop-forged steel teeth.
17. Lips or teeth points hit first.



OWEN CLAMSHELL BUCKETS INSURE A BIGGER DAY'S WORK

Owen Buckets



EIGHT HOURS' STEADY RUNNING— STILL COOL ENOUGH TO HANDLE!

THIS man was in the market for a new compressor. He liked the "Davey," but couldn't believe us when we tried to explain the big principle of "air-cooled air."

So we took him to a Davey Compressor that had been in steady operation for eight long hours. "Lay your hand on the compressor head," we told him.

Skeptical, he moistened the tip of his finger, trailed it across the head in a flash. Not a sound! Then a cautious tap with the fingers, followed by a quick appreciative grin as he discovered the head was warm, but not sizzling—actually cool enough to touch with comfort, *after hours of steady running!*

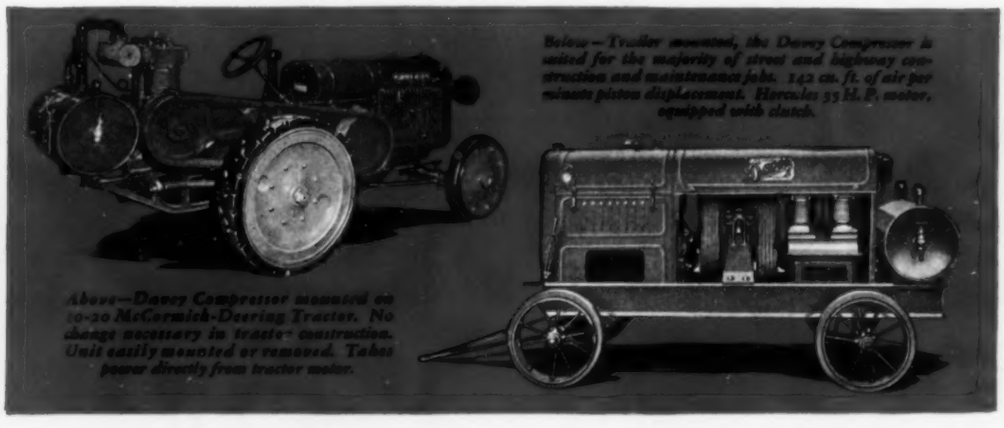
The simple explanation is that Davey Compressors expel heat instantly from the point of compression, out through compressor heads and manifold made of special aluminum alloy, and with deep fins that give greater radiation. Compression generates high heat *inside* the heads and manifold, but it passes through the aluminum instantly to the *outside* and is instantly taken up by the outer air. Heat simply doesn't have time to gather—the aluminum parts keep it on the move every second.

Here's something else mighty important: since the compressor heads are always cool, there's no chance for oil to burn and form carbon. The average operating temperature of the Davey Compressor is nearly 150 degrees less than would be required to burn oil and form carbon—so you can always depend on "Daveys" to continue operating at their full efficiency. ***No Davey Compressor has ever yet required carbon removal from its valves.***

You must have a Davey, if you want all the advantages that Davey offers. A new, interesting booklet tells all the why. Better write for your copy today.

DAVEY COMPRESSOR COMPANY, INC.
KENT, OHIO

SALES REPRESENTATIVES IN ALL PRINCIPAL CITIES

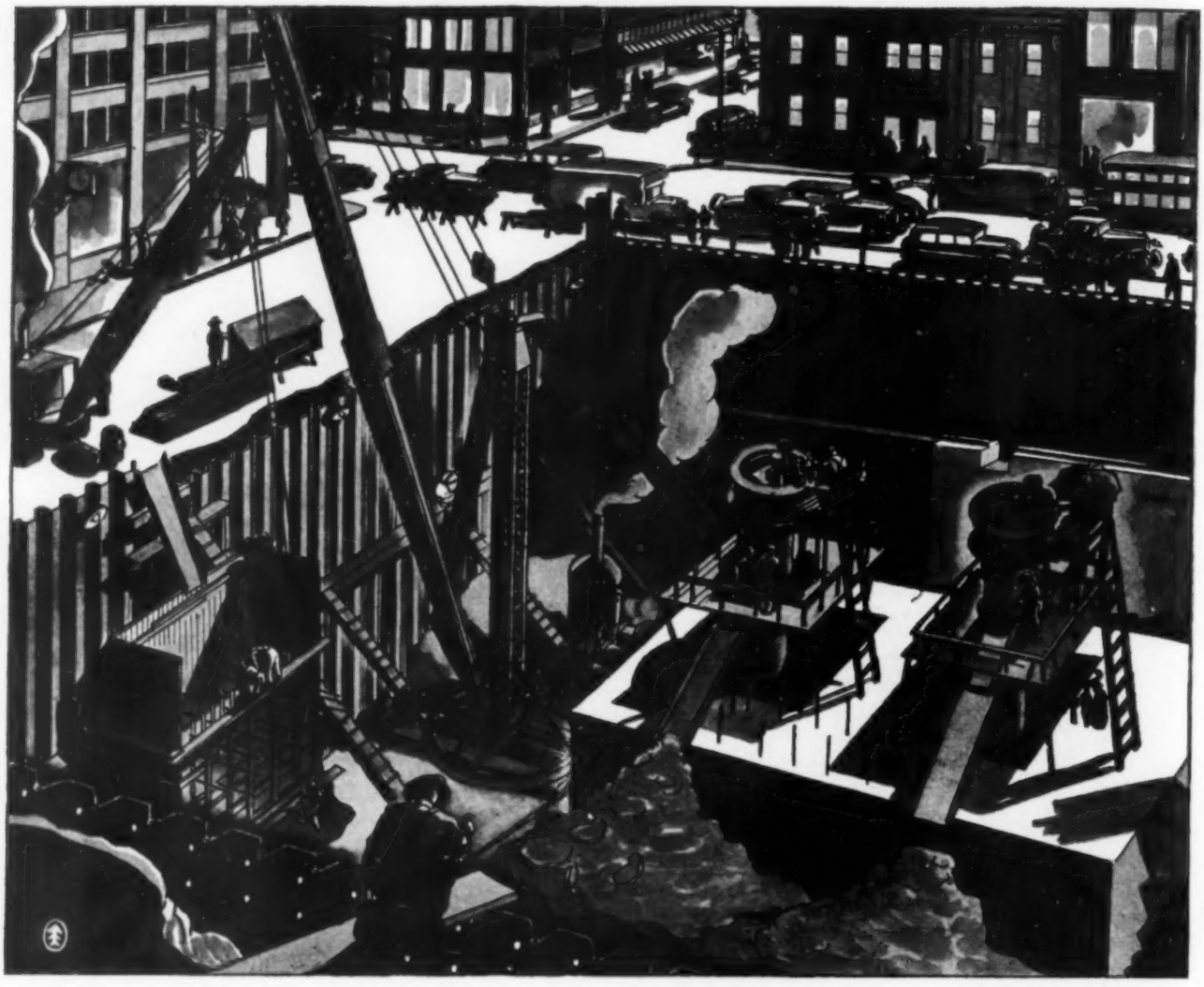


Above—Davey Compressor mounted on 10-20 McCormick-Deering Tractor. No change necessary in tractor construction. Unit easily mounted or removed. Takes power directly from tractor motor.

Below—Trailer mounted, the Davey Compressor is suited for the majority of street and highway construction and maintenance jobs. 142 cu. ft. of air per minute piston displacement. Hercules 35 H. P. motor, equipped with clutch.

DAVEY Compressors

AIR COOLED AIR



Planting a Skyscraper

For all types of foundation work, particularly where adjoining foundations and streets must be protected, Carnegie Steel Sheet Piling is a most efficient device. A group of practical, well designed sections, both straight and arch web, covers every possible condition requiring the use of sheet piling. An interlock of especially rugged construction, easy driving with no tendency to wedge or creep out of plumb, and exceptional watertightness characterize Carnegie Piling sections. Another feature of value in foundation work, or where it may be desirable to keep width of wall to a minimum, is that Carnegie Piling may be driven with arches turned in the same direction.

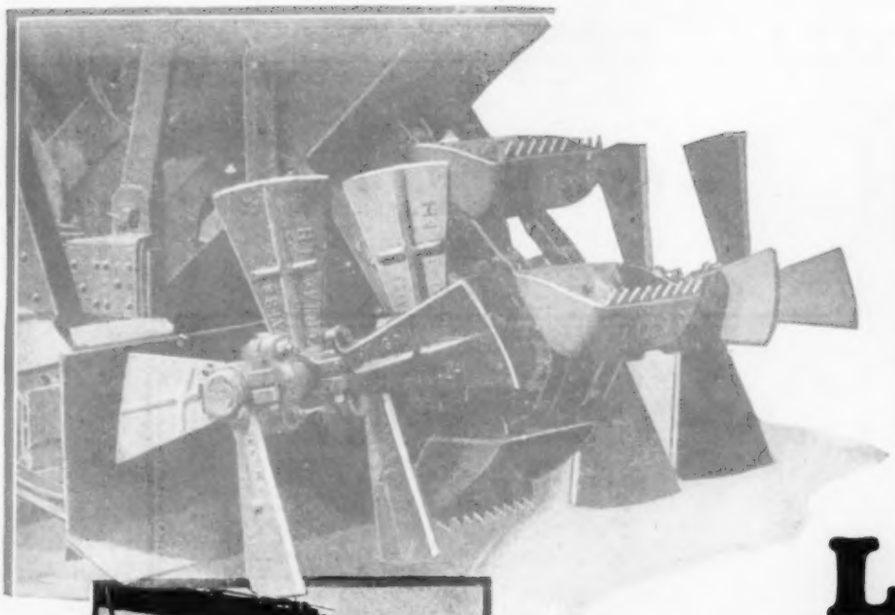
Many years in the promotion of steel sheet piling have enabled us to collect a vast amount of data as to the successful accomplishment of engineering work involving its use. Our engineering department is always at the service of contractors and engineers having such work in hand . . . . . .

CARNEGIE

STEEL SHEET PILING

94

CARNEGIE STEEL COMPANY · PITTSBURGH · PA. Subsidiary of UNITED STATES STEEL CORPORATION



The fast truck get-away from the stock-pile makes for profit. The Haiss "27" Loader handles material fast.

"up to 2 cu. yds. per minute"

*Patented

THE HAISS is the ONLY Loader

with a propeller self-feeding device*

The revolving paddle self-feeding device originated on Haiss Loaders.* It and the slow-speed, worm drive, continuous crowding motion give Haiss machines a digging ability beyond competition. Think of digging into a pile of gummy, tar-bound "cold patch" as it is mixed up for road repair. *Haiss Loaders do it.* Think of excavating in a sand pit and eating into a tightly bedded gravel formation. *Haiss Loaders do it.*

Think of a machine so strong that you can put it at work tough enough to stall the 41 H. P. motor without breaking links or safety devices to protect elevator chains and sprockets. *Haiss Loaders have none.* Think of how much less it will cost you to buy a Loader that will do most work at the lowest lifetime cost per yard. *The Haiss Loader is that kind.* Better have a copy of Catalog 527 and get acquainted in detail.

GEORGE HAISS MANUFACTURING CO., INC.
139TH STREET AND CANAL PLACE, NEW YORK, N. Y.
Representatives in Principal Cities

H-669

HAISS "Path Digging" LOADERS

TALK NUMBER TEN BY A PROMINENT DISTRIBUTOR

"We BRING . . .

Above—Mr. O. S. Wilcox, President of The M. I. Wilcox Company of Toledo, Ohio. This company's services are of a definite economic value to the prosperity of its business territory.

to our friends the personal touch which makes credit easier to obtain—increases speed of delivery in stress times—induces care of selection of merchandise—quality and fitness, which together with general understanding makes business more pleasant and more profitable.

We recommend Republic's Belting—Hose—Packing—Molded and Lathe Cut Goods."

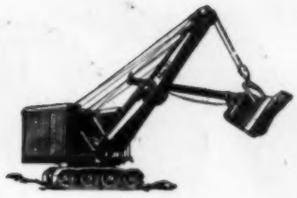
The above statement is characteristic of those made by prominent distributors all over the country. It explains in part how the Industrial Supply Distributor, helping to solve the important problem of broad markets and economical distribution, upholds high quality, maintains fair prices and saves needless efforts on the part of both consumer and manufacturer.

Republic's line of air hose, ranging in size from ½ in. to 1½ in. inclusive, in either the molded and braided con-struction - wrapped fabric construction - or - braided, but not molded construction will meet every known condition requiring this type of hose.

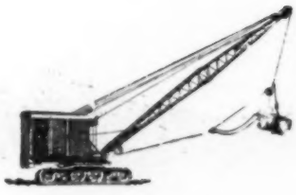
Write for sample and prices.

THE
REPUBLIC RUBBER CO.
Youngstown
Ohio

REPUBLIC means the Best Mechanical Rubber Goods



THE CENTER DRIVE CRAWLER with power direct from the motor, with two traveling speeds, with the fewest moving parts of any modern crawler, with interchangeable rocker arm extensions for greater length, has never been surpassed for dependable performance in the six years since it was first introduced.

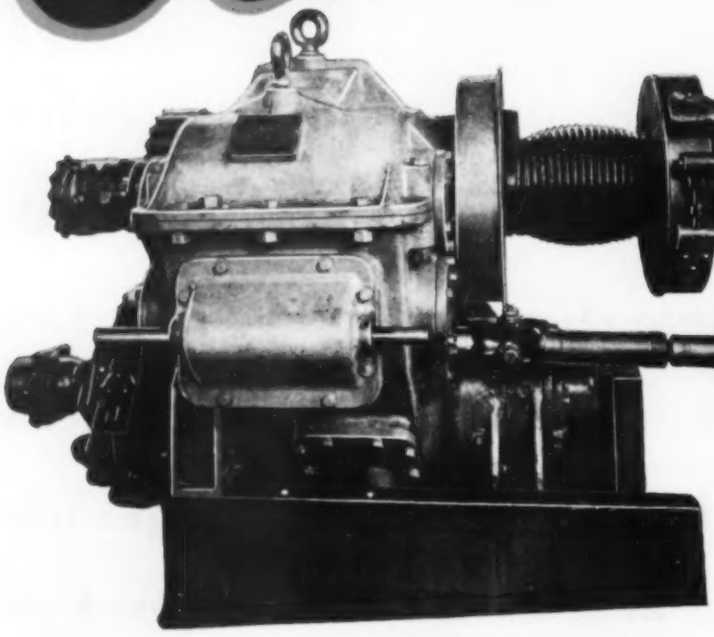


THE THEW SHOVEL CO.

LORAIN, OHIO

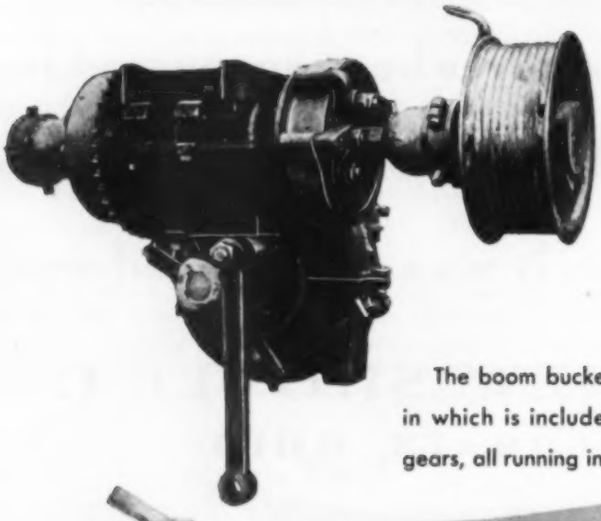
THEW LORAIN

Ransome

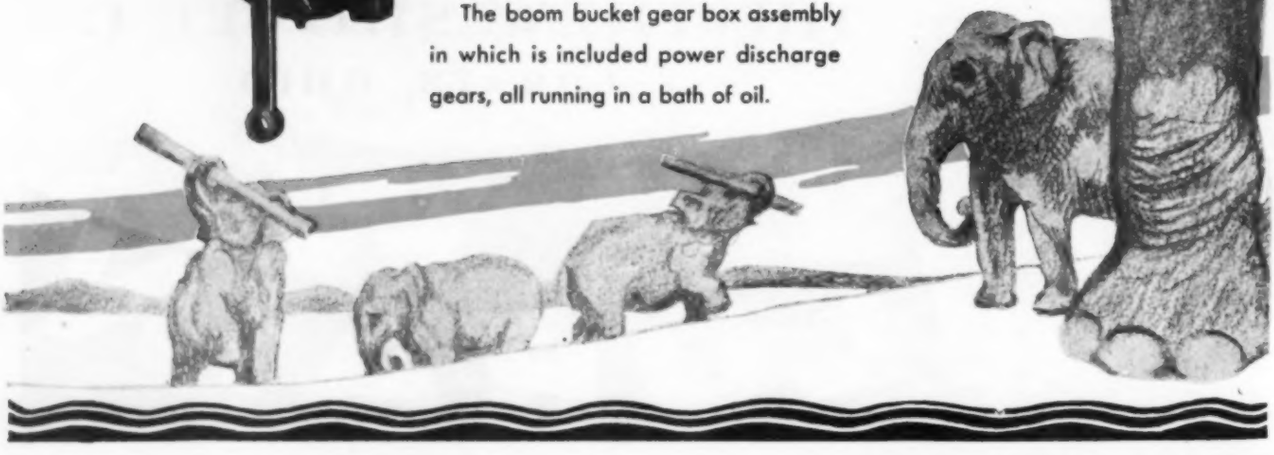


The main Gearing Box contains reduction gears, traction drive bevel gears with their jaw clutches and change-of-speed gears, all running in a bath of oil. Note the accessible construction.

A third enclosed gear box is used for the power boom swing



The boom bucket gear box assembly in which is included power discharge gears, all running in a bath of oil.



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A BRUTE FOR WORK

MORE POWERFUL . . . STURDIER . . . FASTER . . . LOWER IN HEIGHT
SIMPLER IN DESIGN THAN EVER

Water control is *accurate*. It is not affected by grades or by sudden starting or stopping of the paver when tank is discharging into drum. Adjustment is made by a handwheel carried to operator's platform. Water valve, non-by-passing type.

Boom swings through an arc of 170 degrees.
Powered by a 6-cylinder, heavy-duty, 65-70 h. p. gasoline engine.
The new Ransome "Master" Paver will make you master of the biggest paving jobs.
Write for a folder today which gives complete specifications.

Ransome Concrete Machinery Company

1850 — Service for 80 Years — 1930

Dunellen **New Jersey**

LACKAWANNA PILING SECTION AP 16

used in constructing foundations for new

CITIES SERVICE BUILDING

New York City

Clinton & Russell, New York City
Architects
James Stewart & Co., New York City
General Contractors
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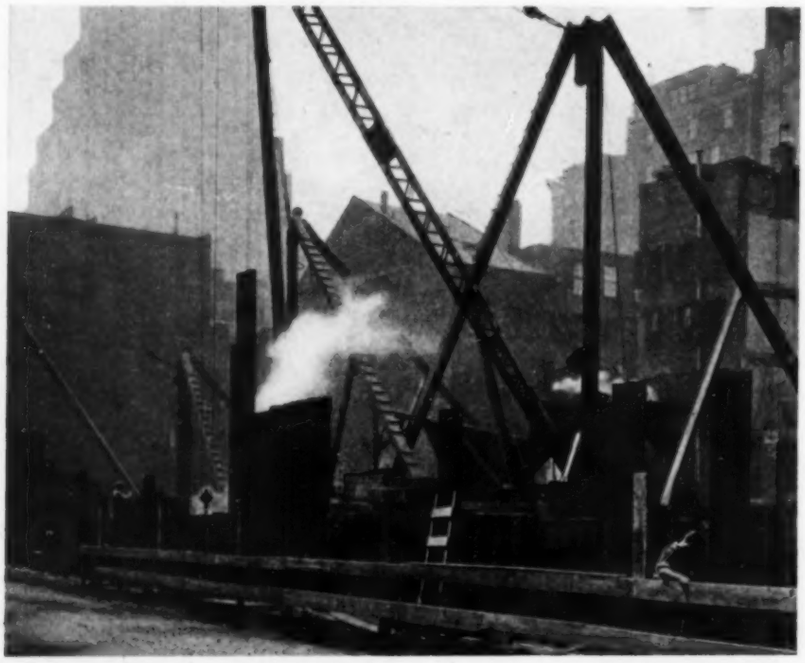
Foundation Contractors



More than 600 tons of Lackawanna Arched-Web Piling Section AP 16, in lengths up to 40 feet, are being used in the construction of the foundations for the new Cities Service Building, in New York City. Although Lackawanna Section AP 16 is comparatively new, having been on the market for less than a year, its selection for this as well as for many other important projects is evidence of the extent to which it has won acceptance by engineers and contractors.

Lackawanna Section AP 16 is 16 in. wide, has a uniform web section of ⅜-in., a strong, positive interlock, and weighs only 22 lbs. per sq. ft. Its flat design offers sufficient transverse strength for driving in long sections and for economical bracing, and at the same time results in minimum driving resistance and minimum tendency to damage at the top from heavy steam-hammer blows.

The most important advantage of Lackawanna Arch-Web Piling Section AP 16 is the fact that it can be driven with all of the arches on the same side of the piling wall. Consequently, in foundation work and in constructing interior foundation walls of trenches, the effective thickness of walls is very slightly reduced and practically no concrete is lost in pouring, as is the case when piling is driven with the arches alternating inward and outward.

There is a Lackawanna Piling Section —Deep-Arch, Arch-Web or Straight-Web for every purpose. Bethlehem engineers will gladly cooperate with you and suggest the section most suitable for your job.

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District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Cincinnati, Detroit, Chicago, St. Louis.

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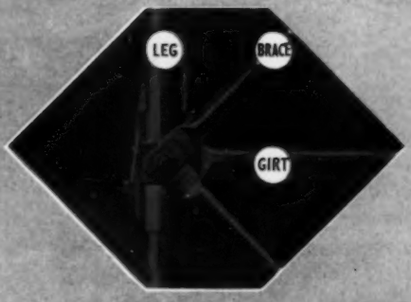
BETHLEHEM

CHRYSLER BUILDING
New York City
Fred T. Ley & Co., Inc.,
General Contractors
Height 1088 feet,—the highest building in the world. Served by six double American Tubular Towers varying in height from 390 to 762 feet.

BANK OF MANHATTAN BUILDING
New York City
Starrett Brothers, Inc., Builders
Height 925 feet—the second highest building in the world. Eight American Tubular Towers with one to four compartments per tower and with heights from 351 feet to 762 feet used in its construction.

A towering success among builders of the nation's greatest skyscrapers »»»

AMERICAN



TUBULAR TOWERS

KOPPERS BUILDING
Pittsburgh
Mellon-Stuart Co., Contractors
Three double American Tubular Towers, one tower 507 feet high, two 396 feet high used in its construction.

PALMOLIVE BUILDING
Chicago
Lundoff-Bicknell Co., Contractors
Two double American Tubular Towers used, one 533 feet, one 250 feet. In the shaft of the higher tower a 35 cubic foot concrete bucket was used and a record for pouring was made.

For elevating building materials, safely and economically from the lowest to the loftiest heights, these strong, rigid all-steel towers are recognized by the nation's leading contractors as supreme . . . absolutely fireproof . . . quickly and easily erected or dismantled . . . adaptable to the handling of building materials and concrete . . . 100 per cent salvage . . . can be leased or purchased . . . warehouse stocks in principal centers.

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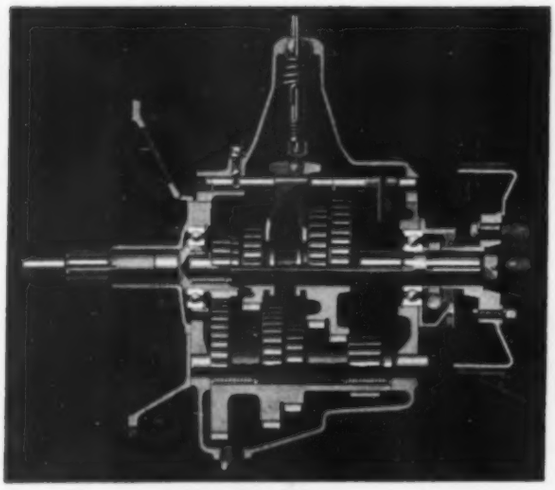
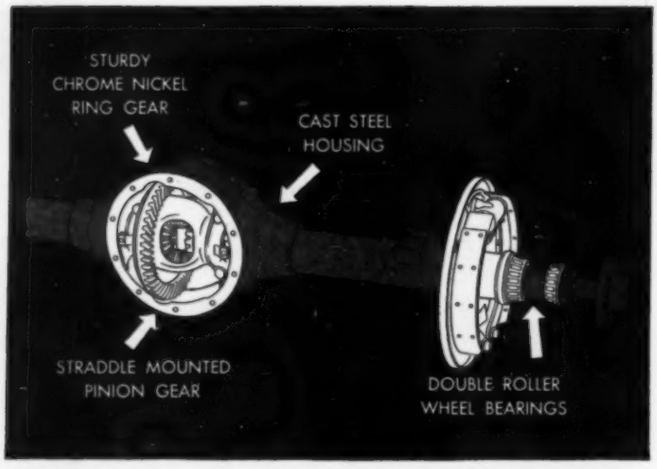
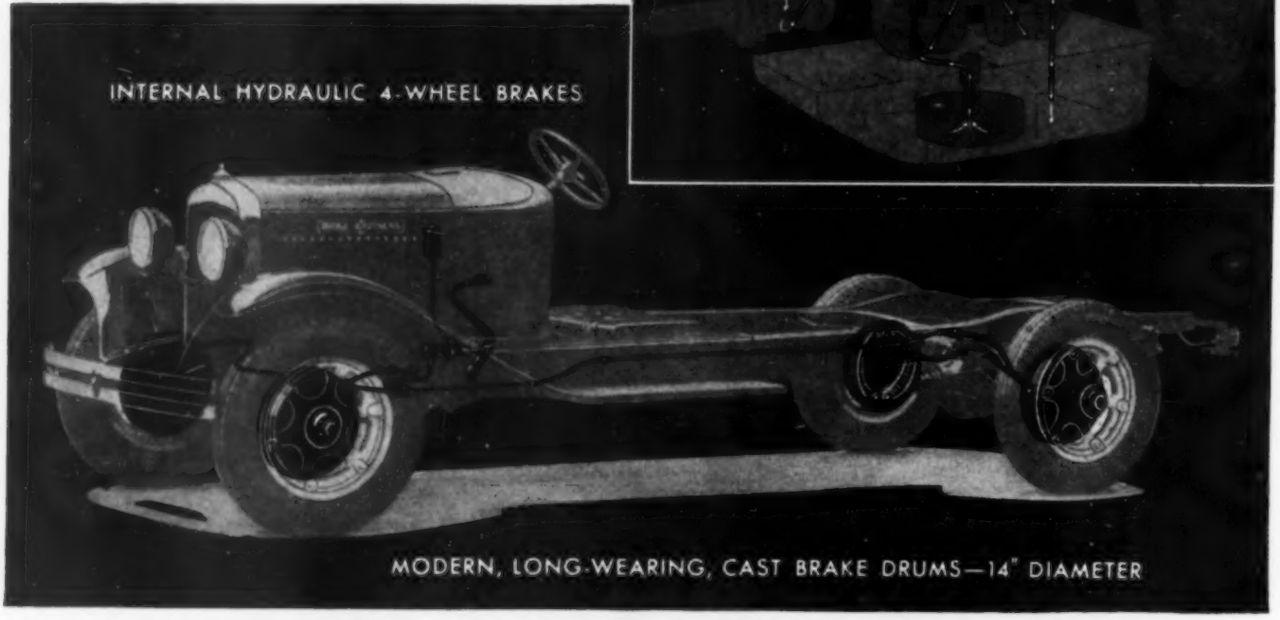


Sturdy, 4-speed transmission insures ample power for hill or hole, and speed for the open road or get-a-way.



With this more costly full-floating rear axle, shafts transmit power solely—and may be quickly replaced without removal of wheels or use of jack.

Full force-feed engine lubrication contributes to dependable, economical operation and long life.



4-wheel internal hydraulic brakes provide safe, sure stopping to match the truck's time-saving acceleration.

THE COMPLETE LINE OF DODGE TRUCKS RANGES IN

the 1½ ton DODGE TRUCK

ITS FULL-FLOATING REAR AXLE . . . INTERNAL HYDRAULIC 4-WHEEL BRAKES . . . 48-HORSEPOWER TRUCK ENGINE . . . 4-SPEED TRANSMISSION . . . AND MANY OTHER MODERN FEATURES. BUY IT COMPLETE WITH STANDARD OR SPECIAL BODY TO FIT YOUR NEEDS.

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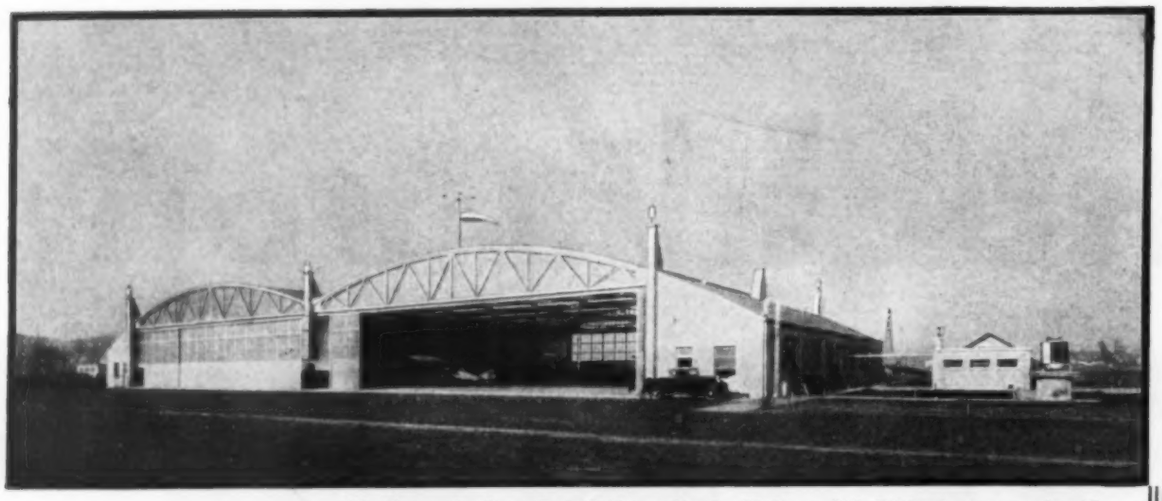
F. O. B. DETROIT . . . DUAL REAR WHEELS AT SLIGHT EXTRA COST

CAPACITIES FROM 1000 POUNDS TO 11,800 POUNDS



New hangar buildings, Central Airport, Camden, N. J. on which California stucco made with Atlas White portland cement was used for the exterior of the buildings. Black & Bigelow, architects, New York. Airport Construction and Development Co., general contractor, Philadelphia. Stucco furnished by California Stucco Products Co., Philadelphia. C. C. Boulden, Philadelphia, plastering contractor.

Beautiful . . .

permanent airport buildings

are as necessary as beautiful railroad depots

Land has been set aside for airports in thousands of American cities. Many of these airports are but little improved. Others have only makeshift accommodations for air travelers. The next step is beautiful, permanent buildings — they are as necessary at air terminals as at railroad terminals.

Hangar buildings at Central Airport, Camden, N. J. have been built for both beauty and permanence. A light tinted stucco, made with Atlas White portland cement, makes them both inviting in appearance from the ground and easily visible from the air. Such buildings as these are a good investment.

35

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Without obligation, please send me booklet "Stucco".

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Construction Methods

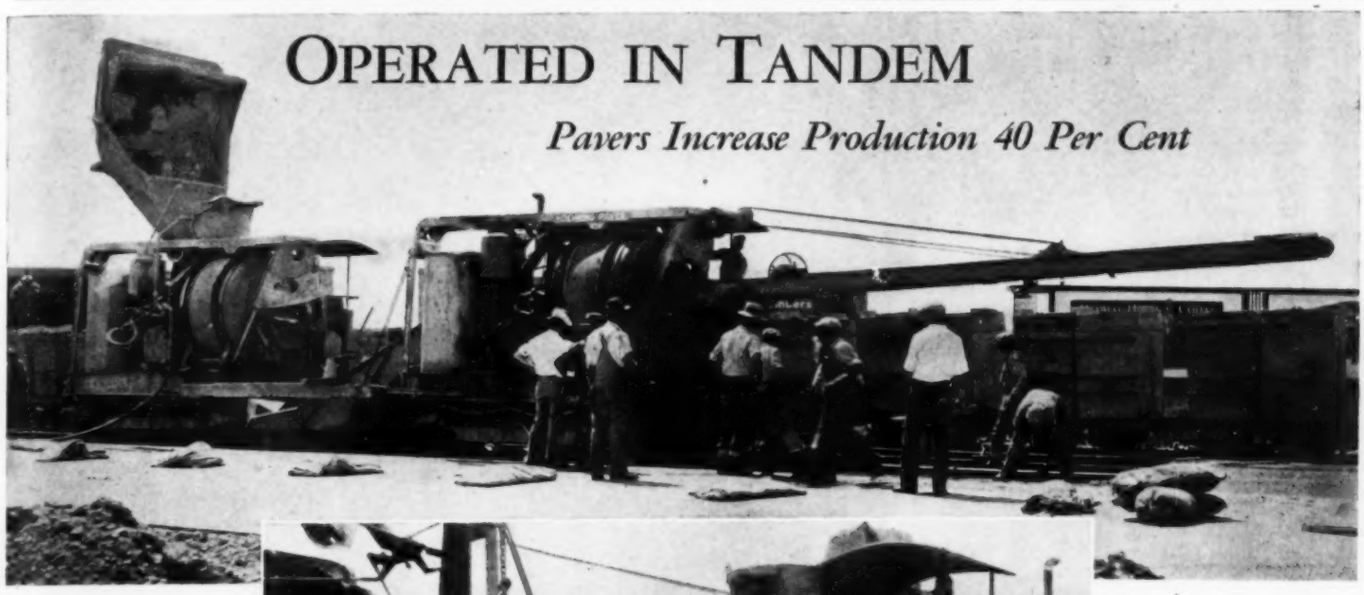
A McGraw-Hill Publication—Established 1919

ROBERT K. TOMLIN, *Editor*

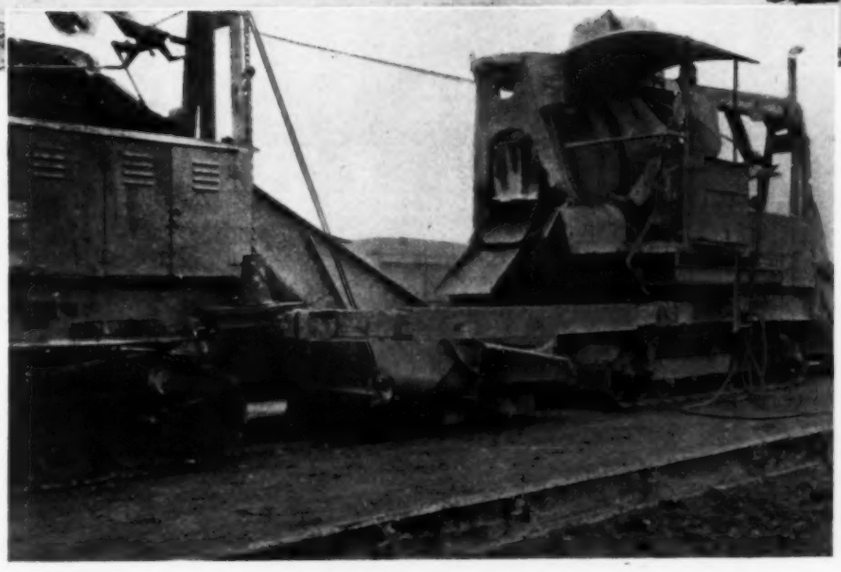
VOLUME 12 NEW YORK, OCTOBER, 1930 NUMBER 10

OPERATED IN TANDEM

Pavers Increase Production 40 Per Cent



PAVERS are spaced so that partly mixed concrete from first machine drops into skip of second, which, in turn, discharges its load into distributing buckets.



DISTANCE BETWEEN PAVERS *(left)* is kept constant by 10x10-in. timber struts, thus preventing spilling or overlapping of concrete as it is discharged from first machine to second.

IN laying a 4-mile 40-ft. concrete pavement on Rand Road, in Cook County, Ill., Jaicks Brothers Construction Co. operated two Koehring 27-E pavers, hitched in tandem. This unusual set-up enabled the company to turn out 65 to 70 batches of 1-min. mix concrete per hour, as compared to 45 to 50 batches, the usual output of a single paver with a 1-min. specified mix. By simply adding one operator to the regular crew, the company increased its daily concrete production more than 40 per cent.

The two pavers were maintained a uniform distance apart by 10x10-in. timber struts. The distance between the pavers had to be kept constant, so that the partly mixed concrete discharged from the first paver would drop into the skip of the second paver without spilling or overlapping.

Materials were proportioned by volume in a central proportioning plant and transported in batch boxes to the first paver by means of an industrial railway. The paver derrick hoisted the boxes for charging the skip. All the water was taken into the batch by the first paver which mixed the charge for 26 sec. The partly mixed materials were then discharged into the skip of the second paver which mixed it an additional 34 sec., making the total mixing time 1 min. The resultant concrete was discharged into the distributing bucket of the second paver, and placed on the subgrade in the usual manner.

The work was done under the direction of Frank Sheets, chief engineer, Illinois Division of Highways. G. N. Lamb was district engineer and Ray Currens superintendent for the contractor.

This Month's "News Reel"

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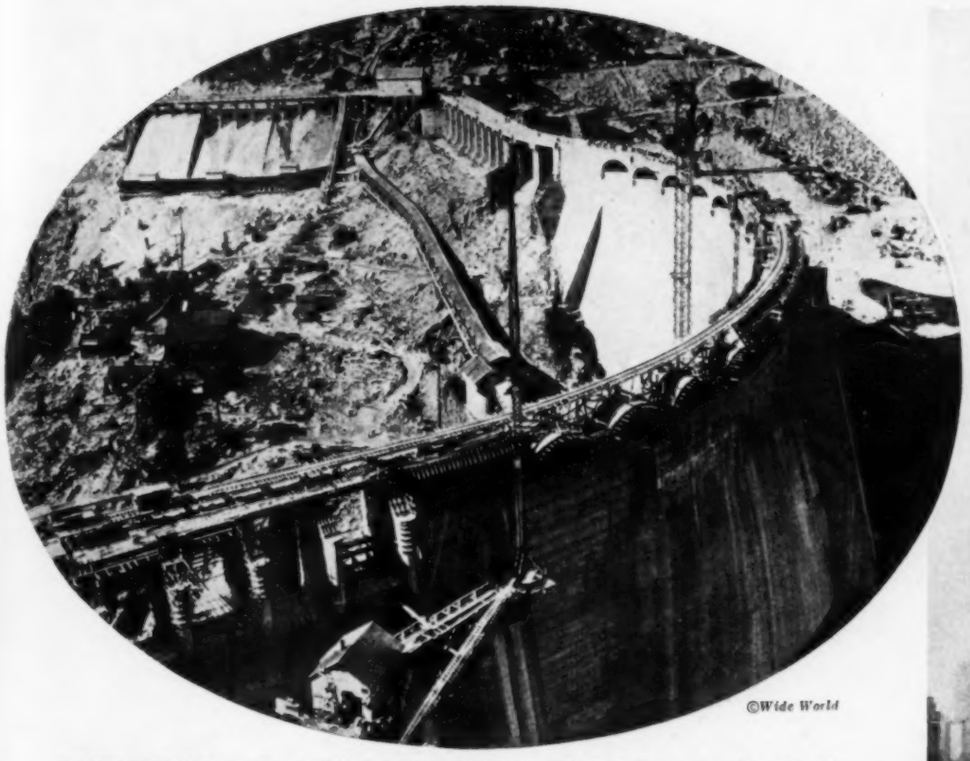
CONSTRUCTION STARTS at Boulder Dam. Dr. Ray Lyman Wilbur, Secretary of the Interior, drives first spike in railway lines at Las Vegas, Nev., which will serve $165,000,000 irrigation and power project.

NEW GOVERNMENT BUILDING *(above)* for Department of Commerce at Washington, D. C., is nearing completion

MID - HUDSON BRIDGE OPENED *(left)*. Mrs. Franklin D. Roosevelt, wife of New York Governor, cuts ribbon to admit traffic to suspension span at Poughkeepsie, N. Y., described in *Construction Methods* last month. Assisting at ceremony are Col. Frederick Stuart Greene *(left)*, superintendent of public works, Ralph Modjeski and Daniel E. Moran, designers of the bridge.

HANDLES 100-TON LOADS. This locomotive crane derrick car, designed for use by American Bridge Co. on viaduct for Indianapolis Union Railway, represents an outstanding development in heavy-duty equipment for steel erection. View shows rig setting 90-ton girder, 130 ft. long.

Photo from
J. L. DE VOU, *Division Erecting Manager, American Bridge Co., Pittsburgh*



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DIABLO DAM on Skagit River is completed by Winston Bros. Co. for city of Seattle, Wash. Constant angle arch structure of concrete is 389 ft. high and 1,180 ft. long on crest. Ultimate development will yield 225,000 hp.

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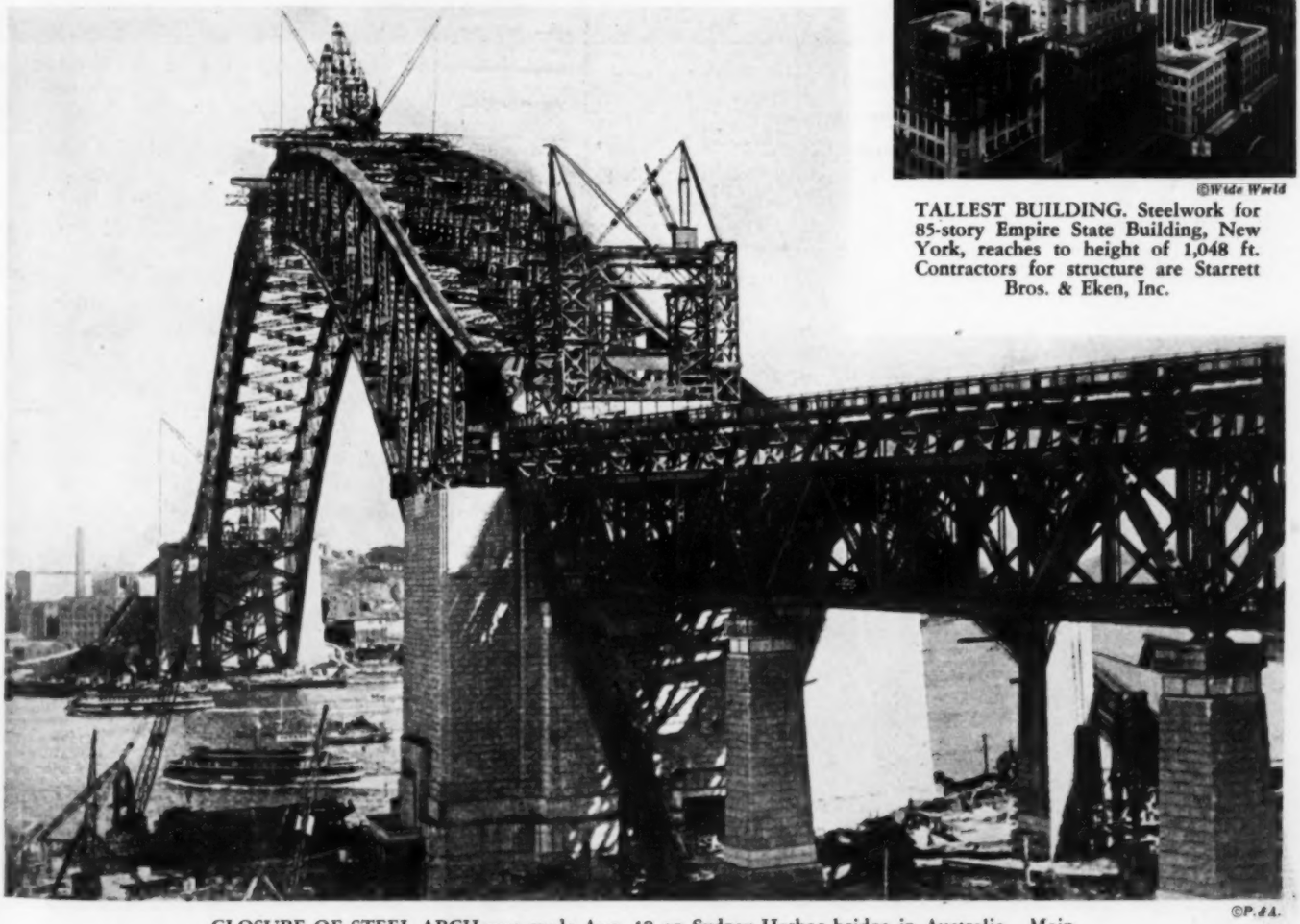
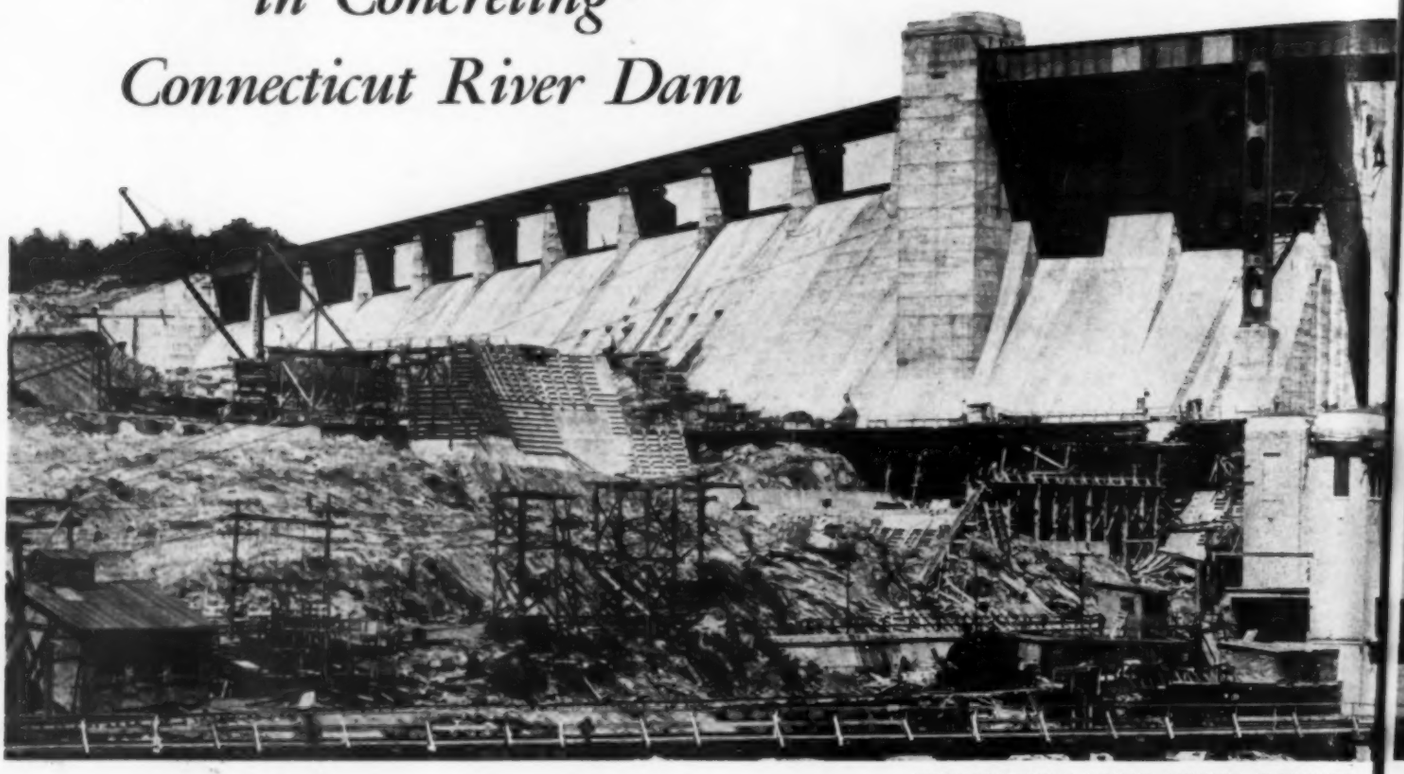
TALLEST BUILDING. Steelwork for 85-story Empire State Building, New York, reaches to height of 1,048 ft. Contractors for structure are Starrett Bros. & Eken, Inc.



©P.&A.

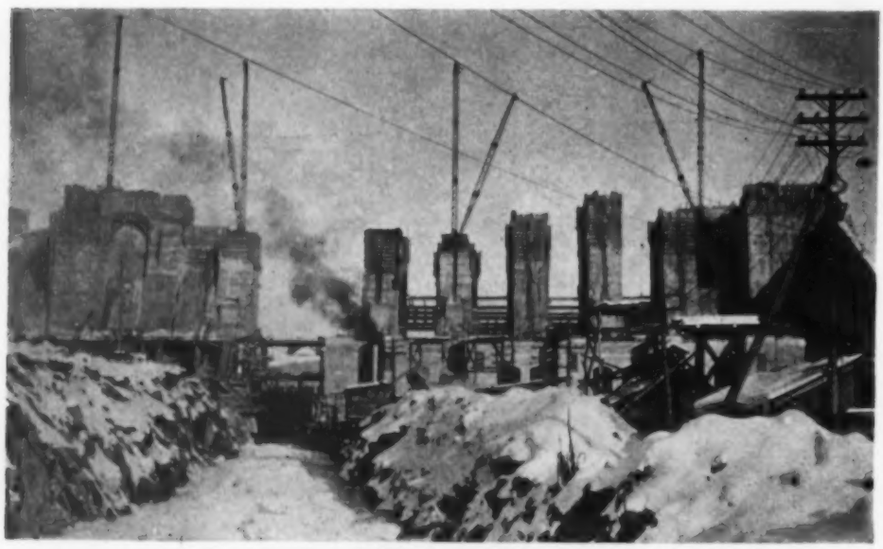
CLOSURE OF STEEL ARCH was made Aug. 18 on Sydney Harbor bridge in Australia. Main span is 1,650 ft. and height 435 ft. The bridge was erected under the direction of Dr. J. J. C. Bradfield, chief engineer, by cantilevering the half arches out from either shore without the use of falsework. The contractors are Dorman, Long & Co., Ltd., of London.

Derricks Place 1,850 Yd. Per Day *in Concreting Connecticut River Dam*



FIFTEEN MILE FALLS LOWER DEVELOP- fill dam. Power house con-

A CONCRETE plant consisting of four 1-yd. mixers and a battery of derricks made a consistently high placing record of more than 1,850 yd. a day during the months of July and August, 1929, in concreting the 175-ft. dam on the Connecticut River at the Fifteen Mile Falls Lower Development, East Barnet, Vt., which began delivery of power from the first of its four 39,000-kva. units this month. Early decision by the Connecticut River Development Co., builder of the dam, to place concrete by bucket, in order to get maximum quality and uniformity, was the main reason for the selection of steel guy derricks with 100-ft. booms as the principal placing equipment. Height of the intake structure precluded use of traveling gantries. Standard-gage gasoline locomotives hauled the concrete from the mixing plant to the dam.

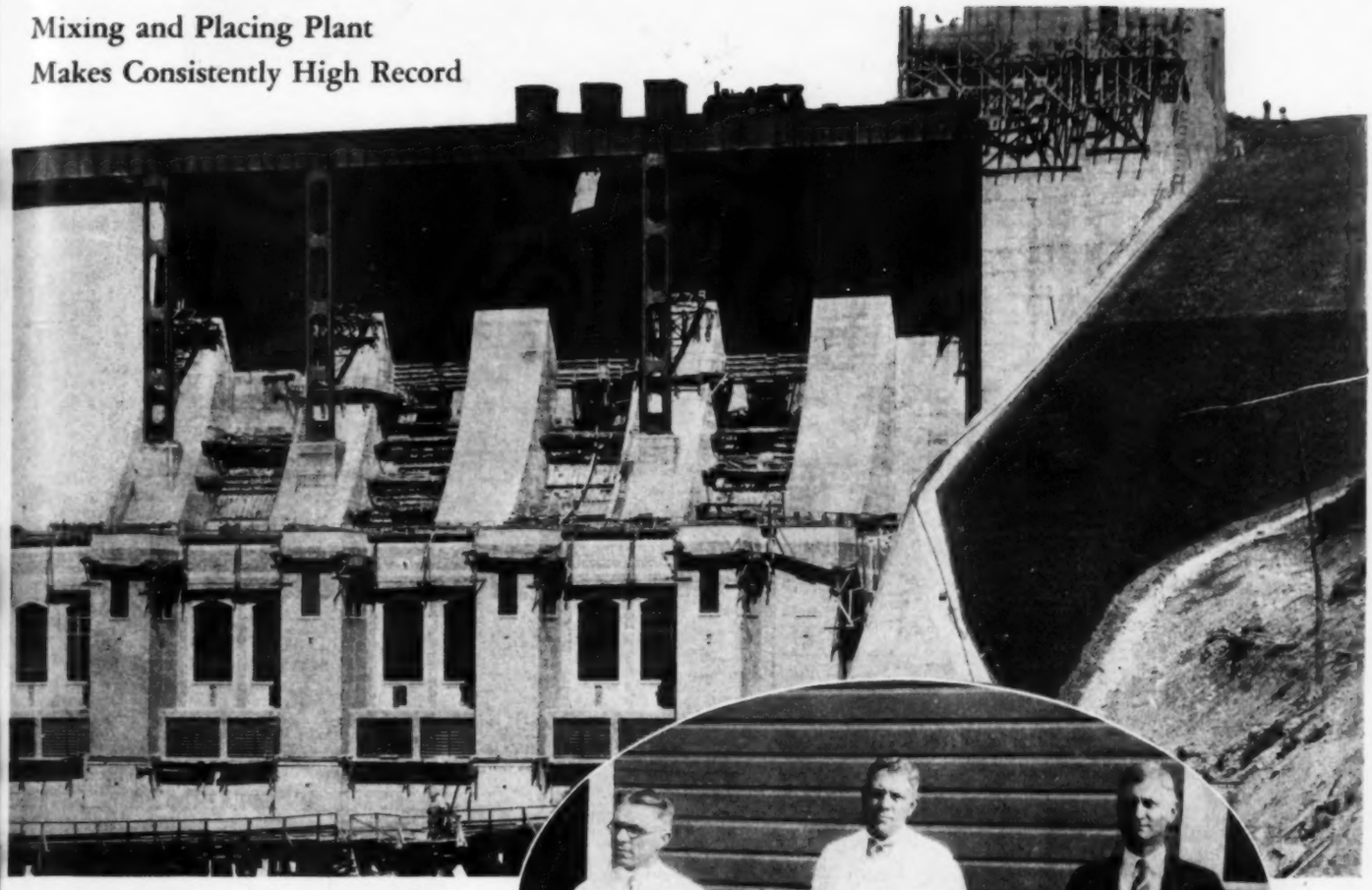


CONSTRUCTION CONTINUES THROUGH WINTER. Builders pour mass concrete in buttresses of non-overflow sections. Ice-packed diversion channel in foreground.

Description of Project—The Fifteen Mile Falls Lower Development is located on the Connecticut River in the towns of Barnet, Vt., and Monroe, N. H., about 1.7 miles above the mouth of the Passumpsic River. It is the middle dam of three included in the New England Power Association's Fifteen Mile Falls hydro-electric power scheme, which will develop a total of 350,000 hp. The Upper Development, of approximately equal size, 8 miles upstream, at the head of the lake formed by the dam of the Lower Development, is ready to be constructed. To regulate river flow below the two plants, a 30-ft. dam has been built at McIndoes Falls, 7 miles downstream from the Lower Development. Normal capacity of the power plant at this dam will be 12,500 hp.

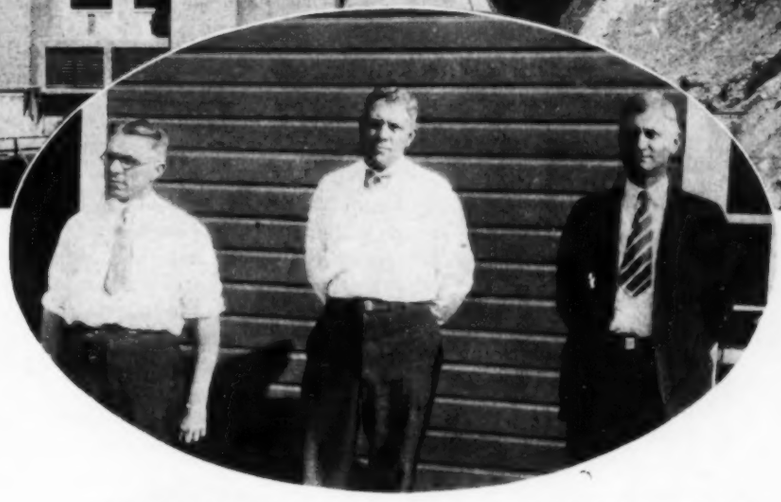
Lower Development—The dam at the Lower Development has a spillway section 850 ft. long, a west abutment 295 ft. in length, and a non-overflow section, in which are located the four intakes and two of the eight permanent sluices, 450 ft. long. Maximum height of the non-overflow section is approximately 180 ft. from bedrock to crest. A 275,000-yd. earth embankment, restrained by a gravity wall running upstream and down-

Mixing and Placing Plant Makes Consistently High Record

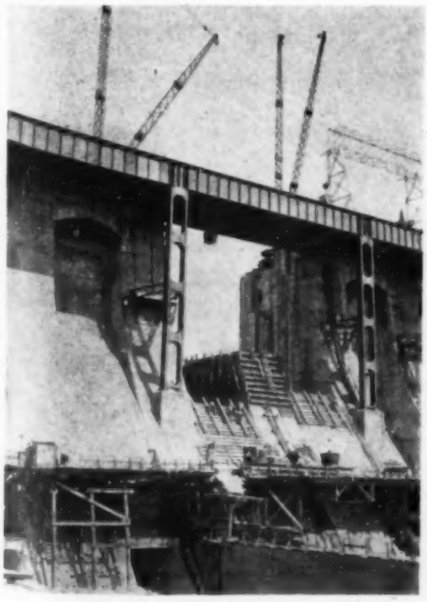


MENT consists of 175-ft. concrete and earth-tains four 39,000 kva. units.

stream at the east end of the non-overflow section, forms the New Hampshire abutment of the dam. Construction of the plant required 1,380,000 yd. of excavation, 360,000 yd. of concrete, and 5,000 tons of structural steel.



IN CHARGE OF OPERATIONS: R. F. OLDS *(left)*, resident engineer; R. B. NORRIS, superintendent; and L. V. BRANCH, resident manager.

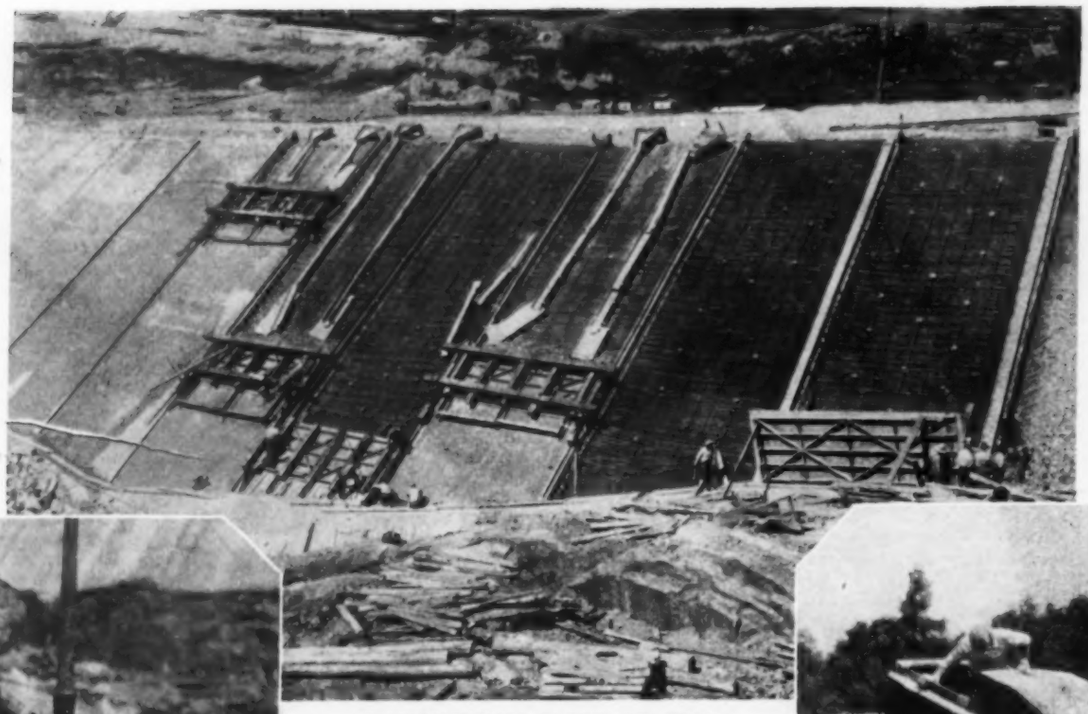


LAST GAP in non-overflow section is closed by derricks erected on top of dam. At bottom of photograph appears one of two high-pressure sluices which carry river flow until penstocks are used.

Stream-flow records available for thirty years revealed one maximum flood of 45,000 sec.-ft. Normally the flow does not exceed 25,000 sec.-ft. In constructing a diversion channel to carry the river, the builders used 23,000 sec.-ft. as the economical design capacity sufficient for all floods within the limits of probability. This channel carried a maximum flow of 18,000 sec.-ft. Two 1929 freshets of more than 25,000 sec.-ft. topped the incompleted upstream power house cofferdam.

Cofferdam — The five cofferdams needed in building the plant were all constructed of rock-filled timber cribs, sheeted on the water side with double 2-in. planking, for watertightness, no puddle cores or toe fills being used. A diver placed all the sheeting, first seeing that all material which had fallen through the crib was removed and then making sure that the sheeting was in good contact with the rock or was driven by maul into overlying material to make a water seal. To help make the seal where the sheeting rested on bedrock, the diver placed a sack half-filled with sand and cement on the rock under the ends of the sheeting. At a few places in calm water where it seemed that a toe fill might reduce seepage, the builders placed a very limited amount of earth or clay fill against the bottom of the sheeting. In swift water, where the cofferdams did not rest on bedrock, a toe fill of heavy riprap was placed to prevent scour.

Three cofferdams were built in the fall of 1928; one for the upstream end of the diversion channel, one for the downstream end, and one for the east



DOWNSTREAM SLOPE OF SPILLWAY CHANNEL is paved with reinforced concrete. After concrete girders have been cast on slope, intermediate slab is poured under movable forms jacked uphill on rails laid on girders.

JACKING DEVICE at each side moves form up rails laid on concrete girders.

SPECIAL HOPPER, built into body of end-dump truck, transports concrete to footings of switch-yard and transmission-line towers.

retaining wall. These cofferdams were high enough for normal stream flows, but they lacked sufficient height to top the unexpected rises caused by ice jams which formed downstream during the winter. To raise the cofferdams to the height necessary to meet these rises, the builders placed additional cribwork on top of the original coffers. The upstream cofferdam had a maximum height of 17 ft. with a 16-ft. base width; the downstream cofferdam, a height of 29 ft. on a 32-ft. crib width.

In the spring and summer of 1929, the intake and tailrace cofferdams were built. The intake cofferdam had a width of 32 ft. and the maximum height of 36 ft. The tailrace cofferdam also was constructed of rock-filled timber crib 32 ft. wide, faced with double sheeting.

The five cofferdams contained a total of 37,378 cu.yd. of rock-filled cribs.

Job Railroad—A railroad to the site of the plant was constructed on the west side of the Connecticut River from a connection with a Canadian Pacific branch at Inwood, Vt., on the west bank of the Passumpsic River. An additional one mile of railroad was required for a switch-back on a 3 per cent maximum grade which provided access to the west end of the permanent track over the dam and to the quarry and sand pits.

Some ten miles of main-line track was laid in the construction yards, not to mention the many miles required for excavation of spillway and tailrace channels.

CONCRETE FORMS consist of 3x11-ft. panels supported by vertical wales which are anchored to concrete of former pours by bolts screwed into sleeve nuts. Bolts are screwed out of nuts when forms are stripped.

A favorable site for the construction camp was found close to a main highway not far from the west end of the dam. The labor camp accommodated 1,600 men. At one time it was filled to capacity.

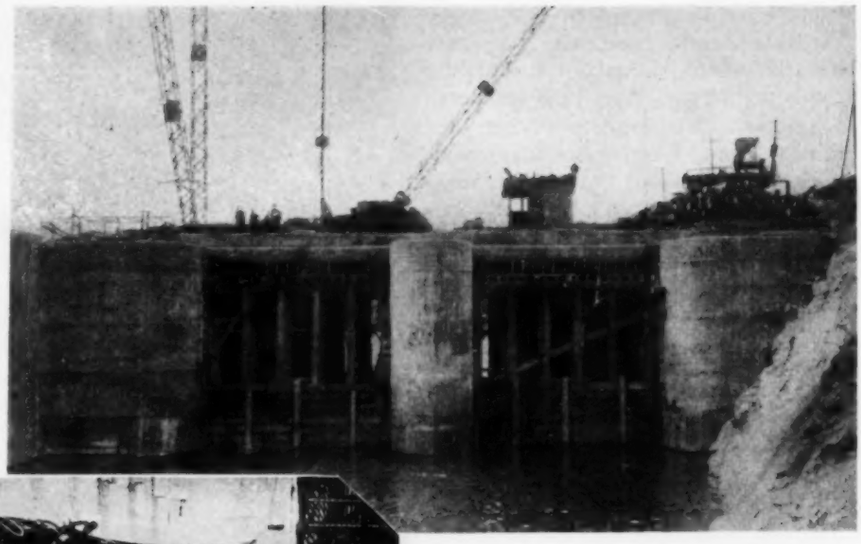
Quarry and Crushing Plant—The builders were fortunate in locating a large hill of excellent trap rock within ¾ mile of the dam. Quarrying this hill provided more than 366,000 yd. of crushed rock for all the concrete used in the plant. Although much of the 244,000 yd. of rock excavated for channels or extra foundations was a massive schist suitable for crushing, none of it was used for aggregate, because it was so mixed with laminated, weathered schist that it was not economical to separate the two kinds of rock.

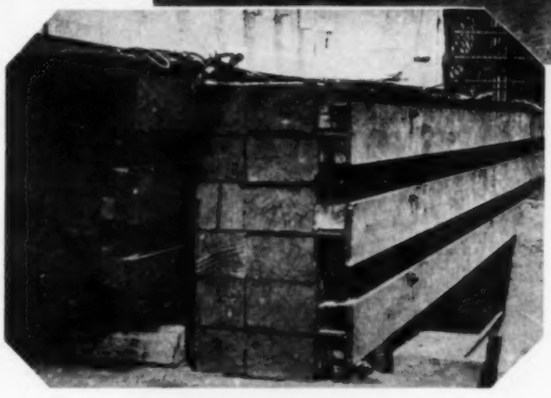
Ingersoll-Rand drills did most of the early drilling at the quarry. After the quarry face had reached a height too great to be worked satisfactorily

with these drills, the quarrymen dug a coyote hole 250 ft. long. They loaded this hole with 34,350 lb. of powder and loosened an estimated quantity of 70,000 yd. of rock with one blast.

Two steam shovels, with 2-yd. and 1½-yd. dippers, loaded the broken rock into 6-yd. side-dump cars. Gasoline locomotives of 8-ton size hauled the cars to the crushers.

The crushing plant was equipped with four crushers: a primary 36x42-in. Traylor jaw crusher, a secondary size 5½ Symons cone crusher, and two smaller gyratory crushers (a 12-in. Austin and a 10-in. McCully) so situated that they could be used either as secondary or tertiary crushers.





ENTRANCE TO DIVERSION CHANNEL ***(above, right)*** **before stop logs are removed to admit flow of river. No. 2 and No. 3 indicate diversion sluices which carry water from April 14, 1929, to June 9, 1930. No. 1 indicates top of 9x10-ft. by-pass opening which carries summer flow from June 9 to August 2, 1930, when final closure is made. STOP-LOGS** ***(right)*** **used to close diversion sluices.**

A revolving screen between the primary and secondary crushers removed the waste and fines from the primary crusher and the dirt from the quarry. This screen also provided for the by-passing of the secondary crusher by all material of suitable size for concrete. At first, a screen with ⅜-in. round holes was used to take out the fines and quarry dirt. As these holes clogged when the material was wet, the builders increased the size of the holes and got good results with screens having ⅝-in. and ¾-in. holes, although these screens did lose some of the finely crushed rock.

All fines from the secondary and tertiary gyratory crushers were left in the crushed rock. These fines, amounting to more than 10 per cent of the crushing plant output, were largely coarse sand which was of much value in supplementing the finer sands obtained in the sand pit. The material naturally contained some crusher dust. Some segregation of the fine and coarse materials in moving the rock to the mixers, especially after it had been placed in storage piles, was the chief cause of difficulty in obtaining a uniform concrete mix at all times.

Concreting Progress—While operating at the maximum, during July and August, 1929, the concreting plant placed 97,382 yd. of concrete. The limit to the rate of placing concrete was the capacity of the mixing plant, using a mixing period of 1½ min. after all materials were in the drums. Records of maximum plant output are quite consistent. During July, the plant produced 48,250 yd., at an average rate of 1,855 yd. per day; during August, it mixed and placed 49,130 yd., an average of 1,870 yd. per day. These records were made in two 10-hour shifts per day.

During the two months the output on 23 days exceeded 1,900 cu.yd. and on four days exceeded 2,000 yd., with a peak of 2,048 yd. On the maximum day, the plant produced 25 batches per hour; the average for July and August was 22 batches per hour.

Mixing Plant—The concrete mixing plant was designed for the use of bulk cement and the gravity handling of aggregates. A track to the top of the mixing plant permitted cars to dump directly into the bins over the mixers. Storage of crushed rock in stock piles under the trestle carrying this track several times amounted to as much as 40,000 yd. No sand storage was needed, as the sand pit was quite close.

Cement was received in bulk and was elevated into silos of 5,000-bbl. capacity. A system of screw and belt conveyors took the cement from the silos, or from the cars as it was un-

DRAFT TUBE FORMS are constructed in place, prior to tailrace excavation.

loaded, and delivered it to the weigh-batch hoppers. Sand was measured in Blaw-Knox inundators, and the coarse aggregate, in volume batchers.

Concrete Distribution — From the mixing plant, 8-ton gasoline locomotives hauled two-car trains with three 2-yd. concrete buckets per train. Jogging of the concrete on this railroad haul caused the coarse aggregate to settle to the bottom of the bucket, with resultant separation when dumped. At several places on the job the builders found it convenient to transfer concrete from one track to trains operating on other levels. In such cases, the concrete was dumped through a remixing hopper, with very excellent effect upon the workability.

Practically all of the concrete was placed in 2-yd. buckets by nine American Hoist & Derrick Co.'s steel guy derricks having 115-ft. masts and 100-ft. booms, with a rated capacity of 15 tons on a flat boom. Each of these derricks was driven by a 100-hp. electric motor on the main two-drum hoist and a 15-hp. motor for swinging. The main hoist was geared to give a single line speed of 300 ft. per minute.

For most of the length of the spillway section, where height of the structure permitted, two wood stiff-leg derricks, mounted on movable platforms, handled both excavating and concreting from a timber trestle erected on the downstream side of the dam. These timber stiff-leg derricks could place only 1-cu.yd. batches of concrete.

Tailrace Excavation—Approximately 120,000 cu.yd. of solid rock was removed from the upstream 1,400 lin.ft. of tailrace area, unwatered by means of the tailrace cofferdam. Jackhammer drills put down the blasting holes. Hand work was necessary in the deep, narrow section near the power house, from which derricks removed the excavated material in skips. In the wider section below the power house, two 1½-yd. crawler-mounted steam shovels loaded the rock into 6-yd. side-dump cars. Two 10-hour shifts removed the rock at the rate of slightly better than 1,000 yd. per day, in a period of 4½ months.

CLOSING MAIN POWER HOUSE COFFERDAM with wedge-shaped crib floated into place.

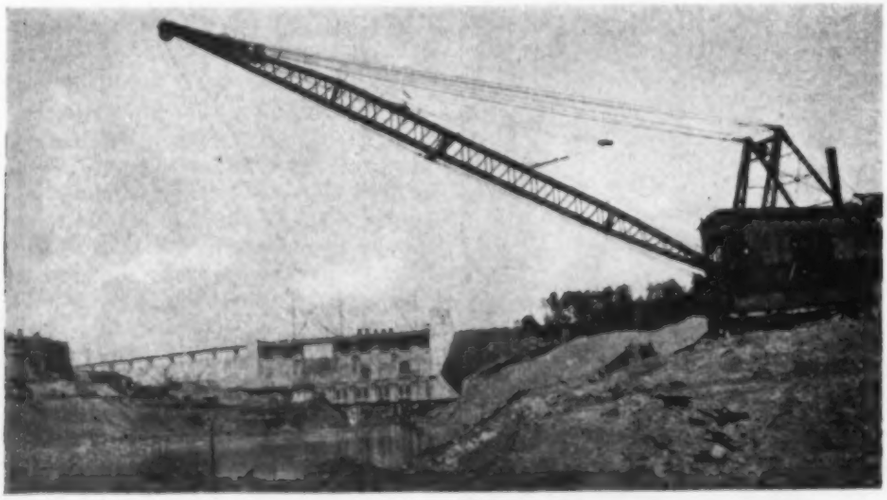
EARTH FILL between east retaining wall and hillside is spread in 8-in. layers by bulldozers to be compacted by 12-ton machine having corrugated roller.

The downstream portion of the tailrace channel is an earth cut 4,900 ft. long, containing about 600,000 yd. The Northern Construction Co., and Stewart & Welch made this cut with a Bucyrus steam dragline, operating a 6-yd. bucket on a 152-ft. boom. The best month's record of this machine on wet excavation was 90,500 yd.

Embankment Construction—Practically all of the 275,000 yd. of earth fill between the east retaining wall and the hillside was placed by the Sanders Engineering Co., of Portland, Me. Four steam shovels stripped and loaded embankment materials, which were hauled almost entirely in trucks. Bulldozers spread the materials into 8-in. layers to be compacted by a 12-ton roller.

Design and Management—The Fifteen Mile Falls Development forms part of the power system of the New England Power Association. Subsidiaries of the New England Power Association designed and constructed the plant, the designer being the New England Power Construction Co., and the builder, the Connecticut River Development Co., with which was associated the Fraser-Brace Engineering Co., Inc.

In charge of construction for the Connecticut River Development Co. were L. V. Branch, resident manager, who supplied the data for this article; R. F. Olds, resident engineer, and R. B. Norris, superintendent.



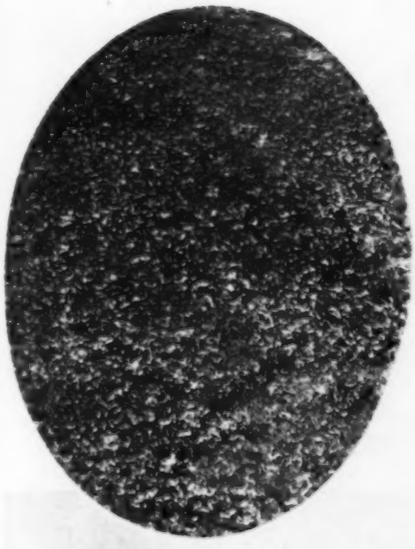
LONG-BOOM DRAGLINE, handling 6-yd. bucket on 152-ft. boom, makes 600,000-yd. wet earth cut for lower portion of tailrace.

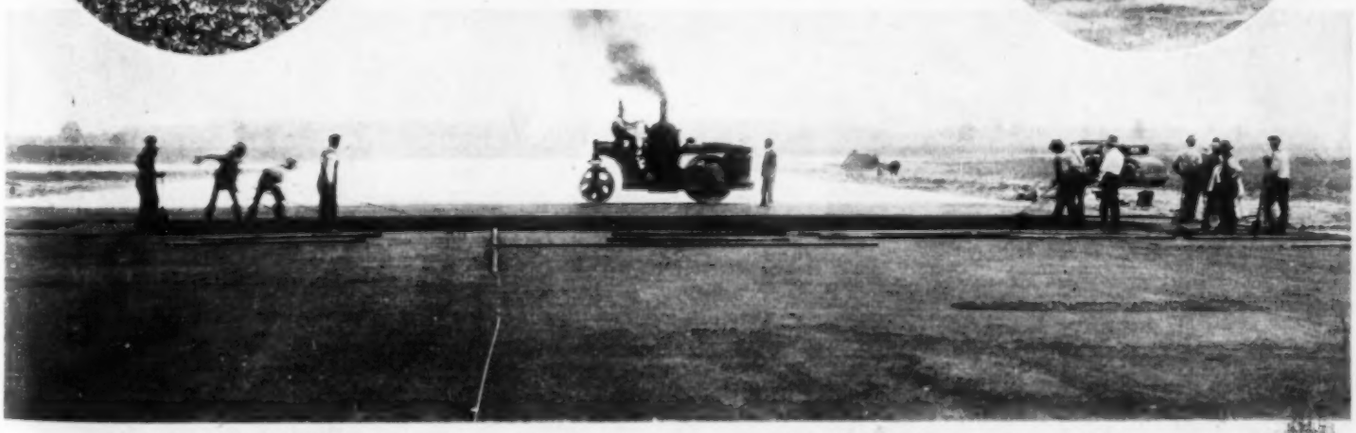
SHEET ASPHALT SURFACE MIXTURE is placed by truck over strips 30 ft. wide. Section of surface at right raked and ready for roller.

Asphalt Runway for Airport

AFTER an extensive investigation of the different types of runways in use at various airports throughout the country, the Department of Aviation of the City of Evansville, Ind., decided to specify all-asphalt runways for the new municipal airport. This type was selected, according to V. H. Goeke, secretary of the department, with the idea of providing a hard surface, less solid than concrete, and with a certain amount of resiliency. Ability to stand up under cold weather conditions and ease of maintenance were other requirements.

The runways, which are 100 ft. wide and 1,200 ft. long, were constructed with Texaco 3-in. asphaltic-concrete base and 1-in. sheet asphalt surface, the latter being laid in strips 30 ft. wide across the runway.





RAKING AND ROLLING sheet asphalt surface of airport runway. BASE *(left oval)* is of 3-in. asphaltic-concrete. COMPLETED RUNWAY *(right oval)* is 100 ft. wide and and 1,700 ft. long.

Building New York's

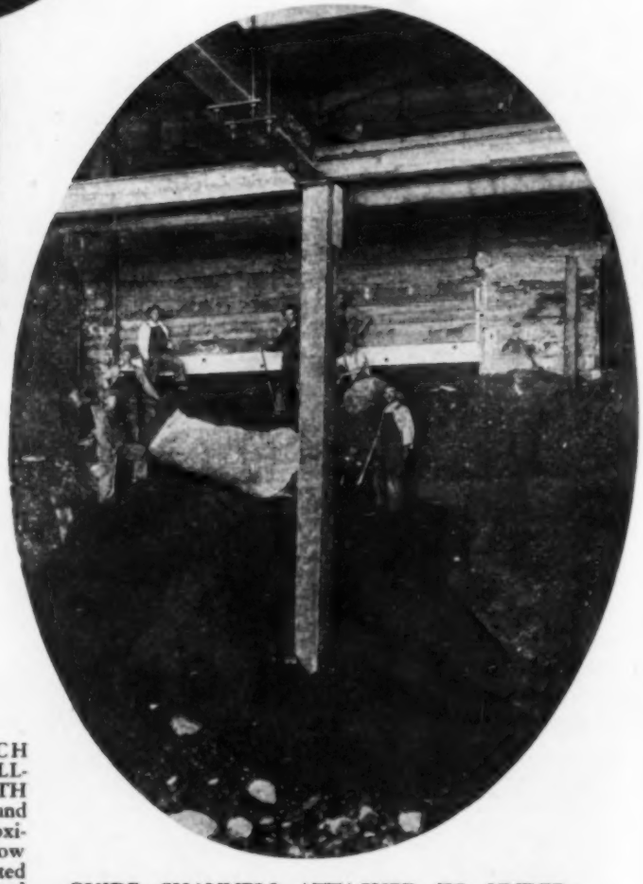
Contractors Develop of Sheeting

SHEETING AND BRACING SYSTEM employed by Culver Contracting Corporation in open trench through park consists of: (1) top lift of vertical sheeting and timber wales and cross-bracing, and (2) bottom lift of vertical sheeting, steel H-section posts, and horizontal steel wales bolted to inside flanges of posts. Note method of bracing tops of steel posts, giving clearance for steel erection.

OLDER types of vertical wood sheeting with horizontal timber wales and cross-bracing, are yielding rapidly to the greater economy of designs using heavy steel wales. Various methods of utilizing the greater stiffness and high strength of steel sections have been developed. Fundamentally, they all depend on the ability to drive heavy steel beams as piles prior to excavating.

These vertical beams are driven to desired penetration below subgrade, giving them a solid toe-hold, and are braced at the top, leaving clearance for excavation and steel erection. Of the several designs of sheeting based on the use of vertical steel beams driven before excavating, the most simple consists of planks installed horizontally between the beams, which act as wales.

COMBINATION STEEL AND TIMBER CROSS-BRACING of George H. Flinn Corporation makes use of 20-in. Bethlehem girder laterals in decking system. DETAIL *(in circle)* of splice between steel and timber portions of strut.



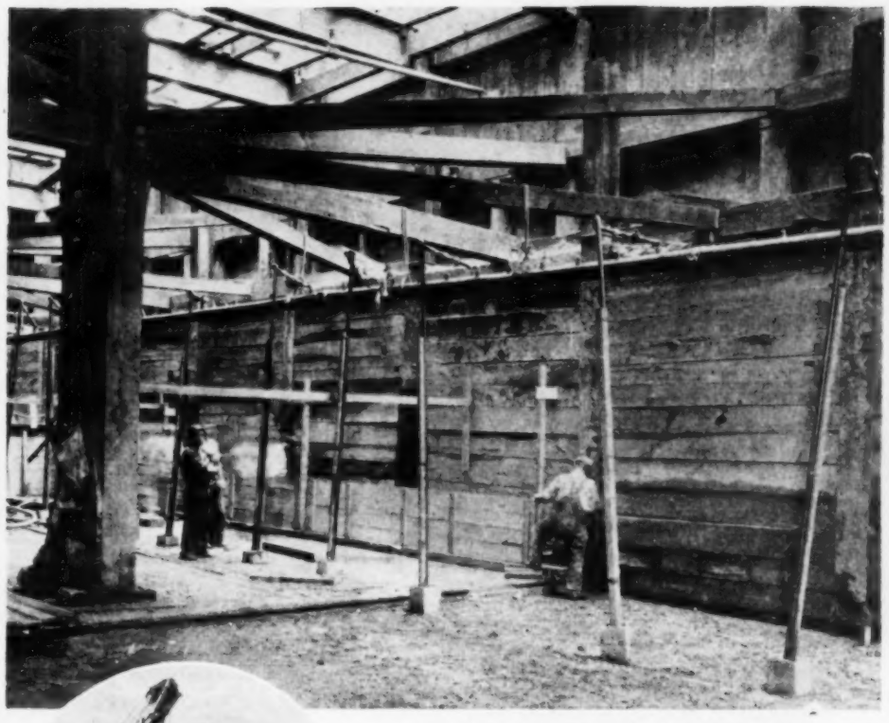
GUIDE CHANNELS ATTACHED TO UNDERPINNING PIERS when piers are poured make it possible for Carleton Co., Inc., to install horizontal sheeting as earth bank is removed. Where conditions permit its use, this method of sheeting is more economical than any other, as it practically eliminates need for posts, wales, and cross-bracing.

OPEN TRENCH THROUGH FILLED, SANDY EARTH *(left)*, with ground water level approximately 12 ft. below surface, is sheeted with steel piles and cross-braced below water level by Rosoff Subway Construction Co., Inc. First cut was made before sheeting was driven.

Subways—III

Economical Methods and Bracing

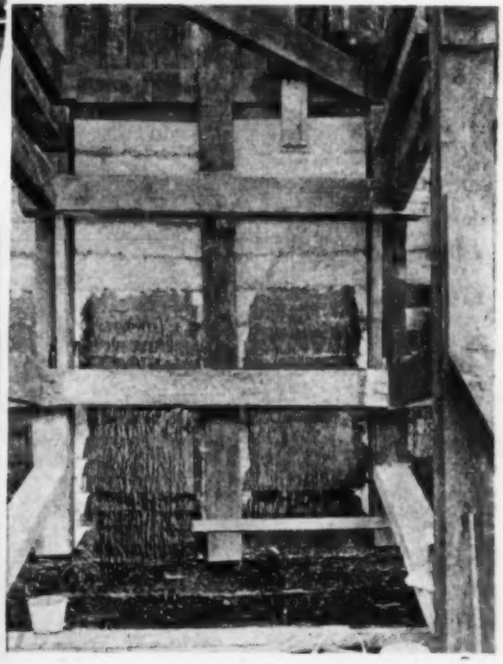
Wood struts and trusses are employed almost entirely for cross-bracing, although the advantages of steel are becoming more pronounced for this use. One of the most interesting methods illustrated in this article shows steel beams used for both vertical walls and cross-bracing.



BRACING AGAINST CONCRETE BLOCKS holds bottom wales of vertical wood sheeting in cut of Atwell-Gustin Morris, Inc.

VERTICAL STEEL WALES *(above)* and horizontal sheeting hold bottom lift of cut in wet sand for Triest Contracting Corporation. Well points lower water level. Note U-bolts holding tops of H-beams to ranger between beams and bottom wale of upper sheeting. Struts placed against ranger brace both upper and lower sheeting. STARTING TO DRIVE (left) 12-in. I-beam wale for horizontal sheeting to be installed as excavation proceeds on Carleton Co., Inc., contract section.

AT BOTTOM OF UPPER LIFT OF SHEETING for two-level subway, Rodgers & Hagerty, Inc., block out 4-in. H-beam wale from 12x12-in. timber to allow driving of bottom lift of sheeting. Dressed lumber holds sand.



PRECAST REINFORCED CONCRETE BLOCKS act as sheeting and become part of permanent structure. Necaro Co., Inc., saves sheeting and concrete by using 4-in. blocks at station where design calls for 4-in. concrete wall. After blocks are waterproofed between vertical wales *(above)*, permanent steel columns are erected between wales 2 in. from wall, blocks are wedged and grouted against steel columns *(left)*, and wales are removed, leaving rest of wall area clear to be waterproofed.

Building New York's

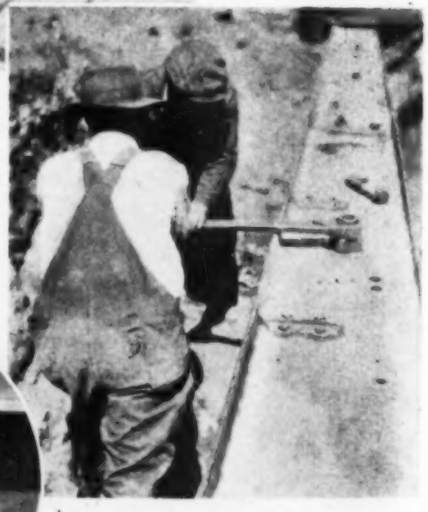
SHEETING CREW installs 3-in. planks between wales as excavation proceeds.

VERTICAL STEEL WALES *(above)* for horizontal sheeting are driven in advance by Arthur A. Johnson Corporation. Wales are 18-in. 58-lb. Carnegie beams on 6-ft. centers.

CRAWLER crane is fitted with leads to drive steel wales approximately 6 ft. below subgrade.

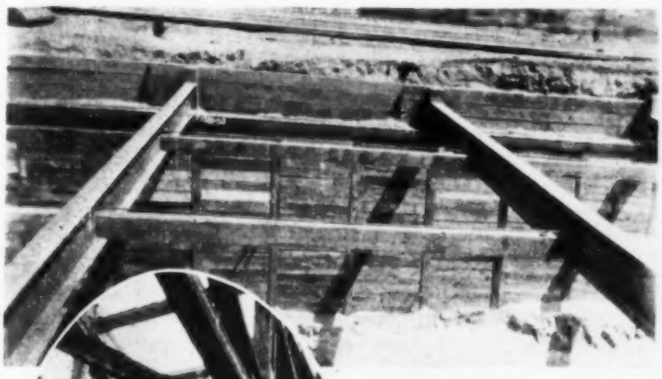
BRACING AND SHEETING DESIGN of Arthur A. Johnson Corporation proves efficient and economical in dry sand. Runner beam (21-in. 80-lb. Carnegie beam) caps vertical wales, permitting wider spacing of 24-in. 100-lb. Carnegie beam cross-braces. System leaves ample space for excavation and steel erection. Vertical steel wales are ultimately pulled.

HOOK-BOLT *(above)* fastens runner beam to vertical steel wales. Holes are cut in webs of both beams. OXY - ACETYLENE TORCH *(right)* cuts bolt holes in flanges of transverse beam and of runner beam to connect bracket.



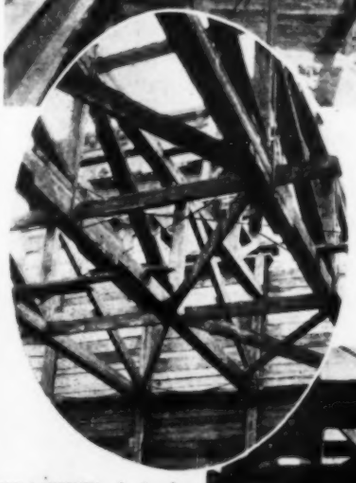
REVERSIBLE RATCHET WRENCH tightens hook-bolt connecting runner beam to vertical steel wale.

Subways—Part III (continued)

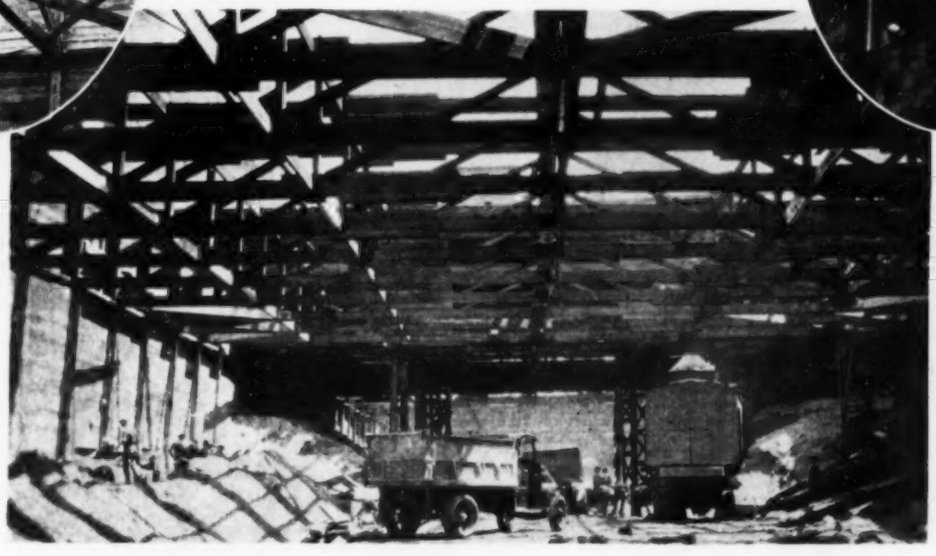


TRANSVERSE BEAMS, acting as struts between two walls of sheeting, are spaced 24 ft. apart and are about 60 ft. long. Tie-rods and spreaders stiffen them.

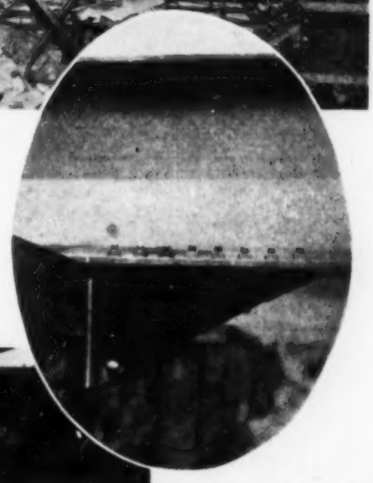
TIMBER TRUSSES brace vertical wales in design used by Corson Construction Corporation. Planks are installed behind wales for part of depth and against inside flanges for rest of distance.



BRACKET, bolted to transverse beam and to runner beam, transfers bank pressure to transverse beam.



BRACED AND TIED at intervals, cross - bracing trusses are made secure against general collapse caused by overturning or dislodgement of a few trusses.

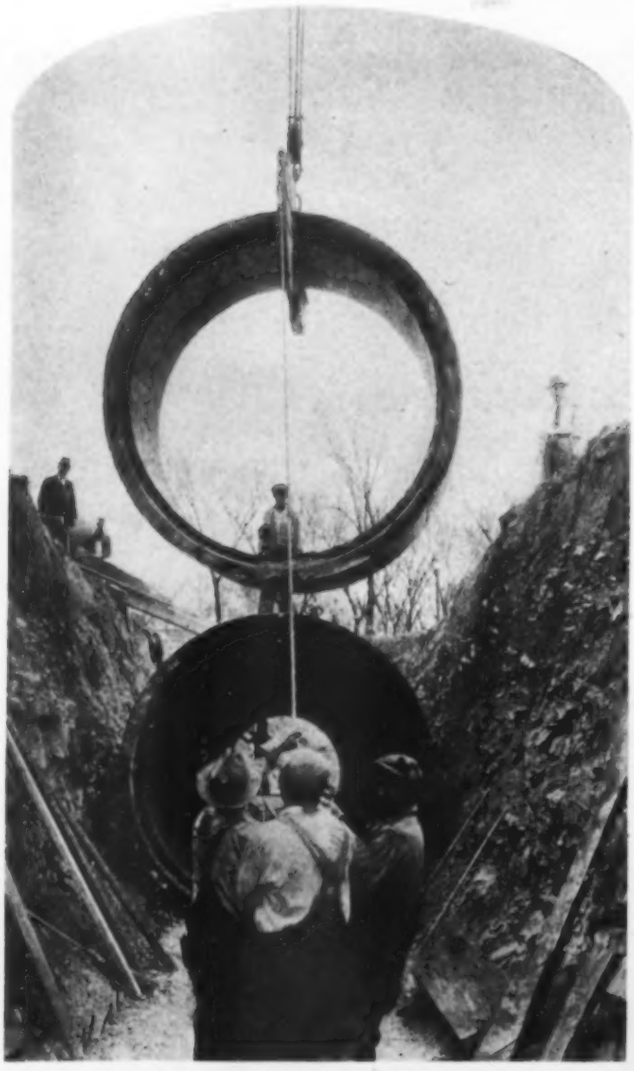


VERTICAL STEEL WALES, 50 ft. long driven on 10-ft. centers to minimum penetration of 3 ft. below subgrade, hold sand banks on Corson Construction Corporation's contract section. Wales are 14-in. 61-lb. H-beams. Each wale is braced by timber truss 10 ft. deep carried on angle bracket. Horizontal sheeting of 5-in. planks is placed between wales.

TO HOLD FLOWING SAND while installing sheeting, steel shield plates are placed behind planks and are worked down after each plank is installed by inserting pinch bar between edge of plank and angle welded to plate.

IN SOLID EARTH, workmen install sheeting without danger of losing material. In area of heavy buildings loss of even small amount of earth is dangerous.

PRE-CAST PIPE *in*



THE casting and laying of sections of reinforced concrete pipe, each weighing 9 tons, constituted the main problem involved in a contract for building 2,440 lin.ft. of 9-ft. diameter circular sewer recently completed in Kansas City, Mo., by the Torson Construction Co. Each pipe section is 5 ft. long, has a wall thickness of 9 in., and is reinforced with built-up cylindrical cages of heavy steel wire mesh.

In excavating for the trench, where the material encountered contained a mixture of earth, soapstone and rock, the contractor used crawler-mounted Link-Belt cranes and buckets. The trench averaged 13 ft. in width and 12 ft. in depth.

Along the line of the sewer the pipe sections were cast by mobile plant equipped with a Koehring mixer mounted on wheels. As shown in the accompanying illustrations, the mixer was rigged to discharge into a hopper-bottom bucket elevated by a vertical hoist to a point high enough for gravity discharge into the forms through an inclined chute. The mix was 1:2:4. Sectional steel forms of three rings for each pipe section well lubricated before each pour, were employed for casting the pipe and in cold weather curing

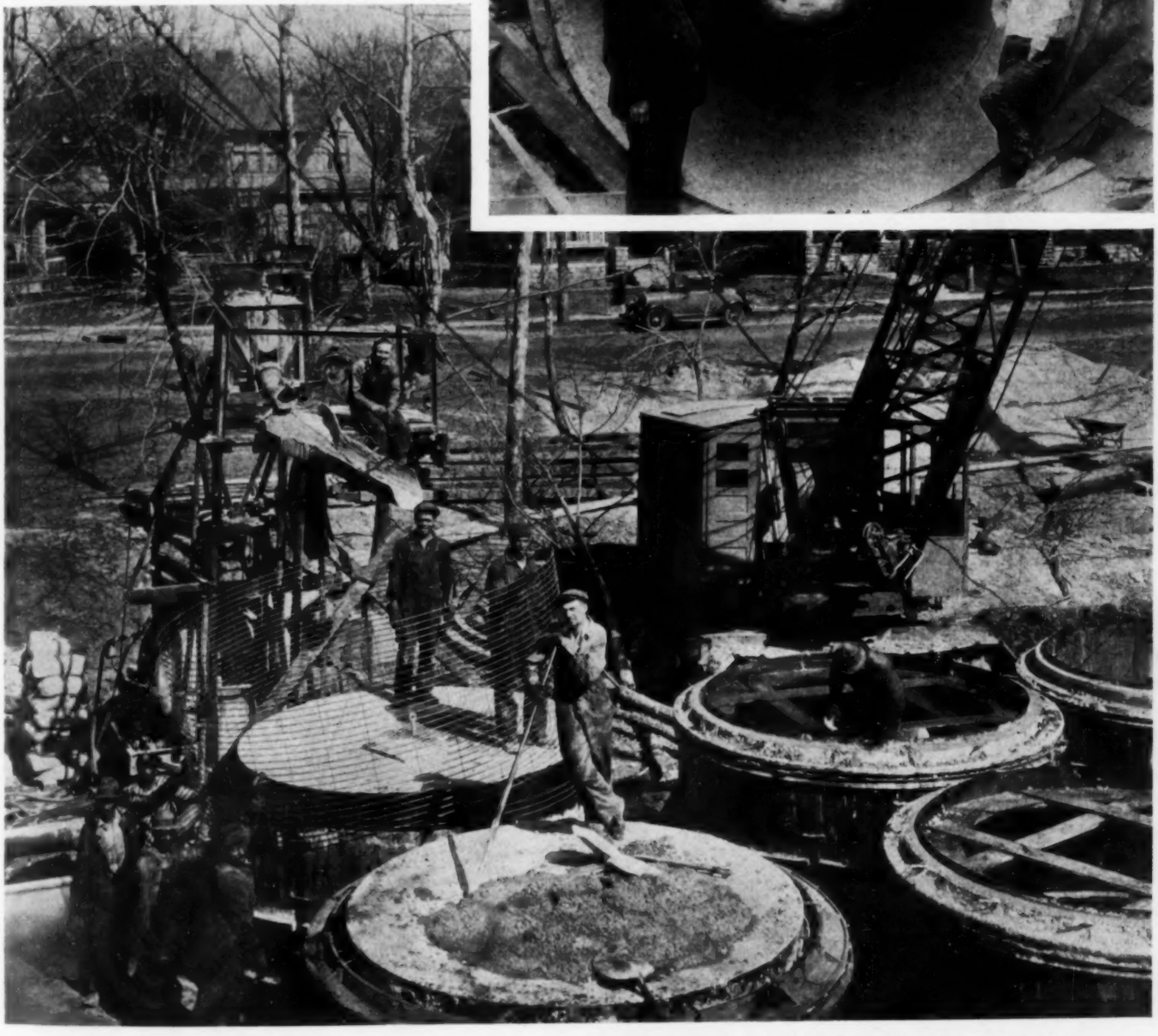
MOBILE CASTING PLANT is equipped with wheel-mounted mixer and chute fed by hopper-bottom bucket and vertical hoist. **NINE-TON PIPE SECTION** ***(above)*** **is lowered by crane to trench bottom.**

9-Ton Sections, Forms Large Concrete Sewer at Kansas City

was accelerated by steaming after the poured sections had been covered with tarpaulins.

The contractor's progress schedule called for casting six pipe sections daily. Forms were stripped the day after pouring and the curing period before the pipe was placed in the trench ranged from 5 to 10 days. The same cranes that were employed earlier for trench excavation were used to handle the pipe from the casting yard into place on the trench bottom, where they are supported by a concrete cradle.

The sewer was constructed under the direction of Robert W. Waddell, city engineer of Kansas City, Mo.

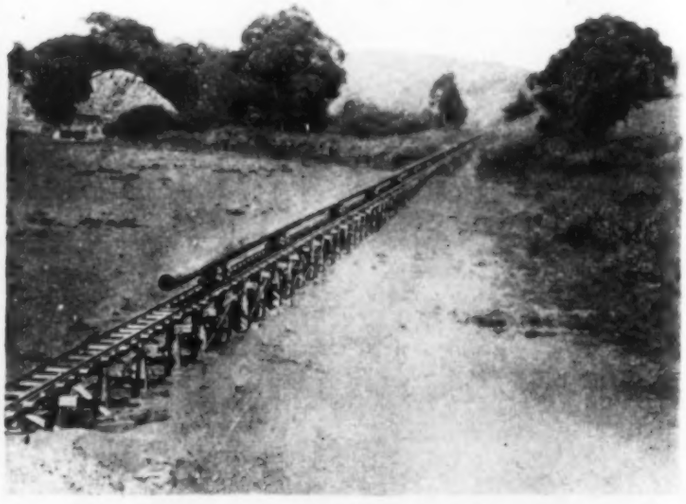


REINFORCEMENT consists of built-up cages of heavy steel wire. Forms are of steel with spigot rings at top. **PIPE IN PLACE** *(above)* showing Martin G. Torson, contractor *(at right)* and John W. Murphy, city inspector.

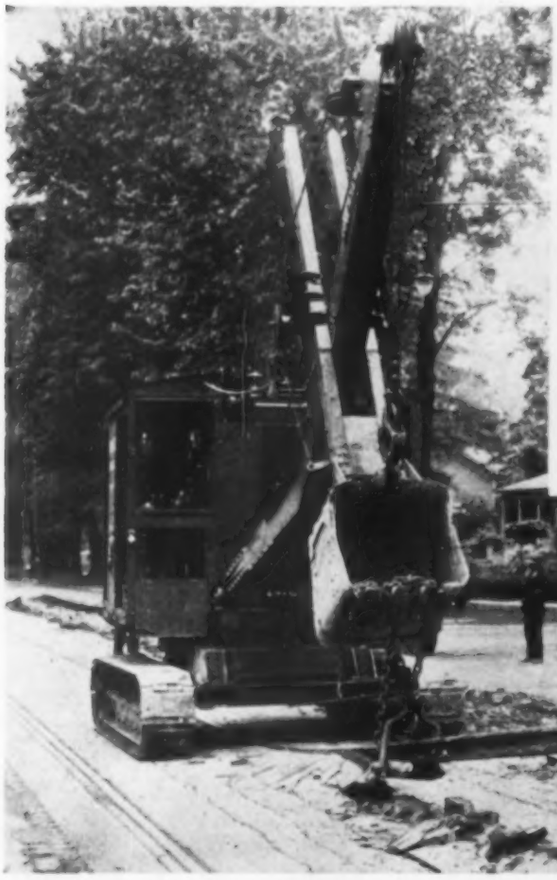
Getting Down to DETAILS

DRILL CARRIAGE, mounted on Best tractor, enables Mittry Brothers Construction Co., of Los Angeles, to operate, simultaneously, three Ingersoll-Rand drills on 18-ft. cut for main canal of Reclamation Bureau's Minidoka project extension.

Photo from John K. Rohrer, associate engineer, Bureau of Reclamation, Eden, Idaho.

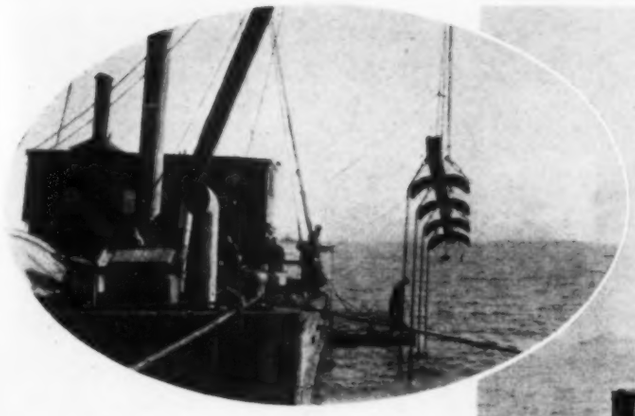


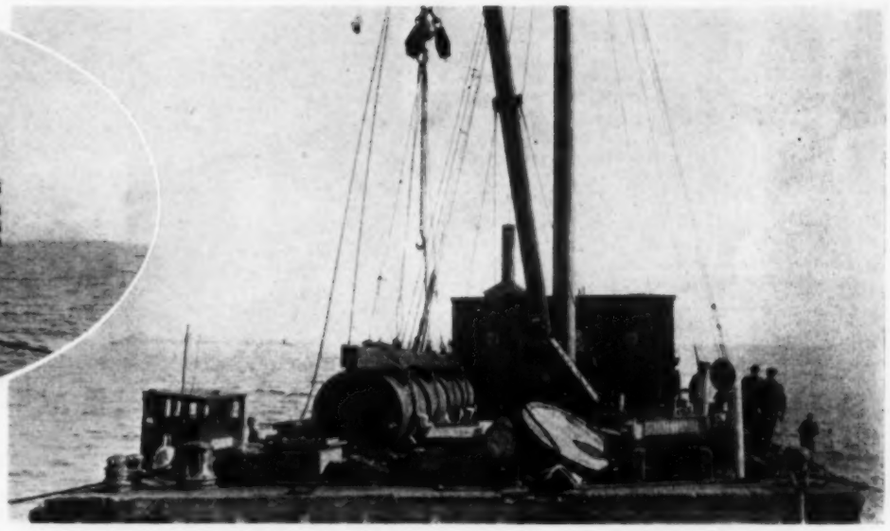
LAUNCHING WAYS, in the form of narrow-gage railroad track 3,000 ft. long, simplified construction of 16-in. submarine pipe line to carry oil to tank ships on California Coast. Welded on shore by oxy-acetylene process into continuous line, pipe was launched as unit.



BREAKS UP PAVEMENT and removes rails of street car tracks. Full-revolving Bay City power shovel speeds repaving job of Brayer Bros., contractors, at Auburn, N. Y.

SILVERY SHEEN *(insert, above)* is given to structural steelwork of Allegheny River bridge at Pittsburgh by application of aluminum paint.



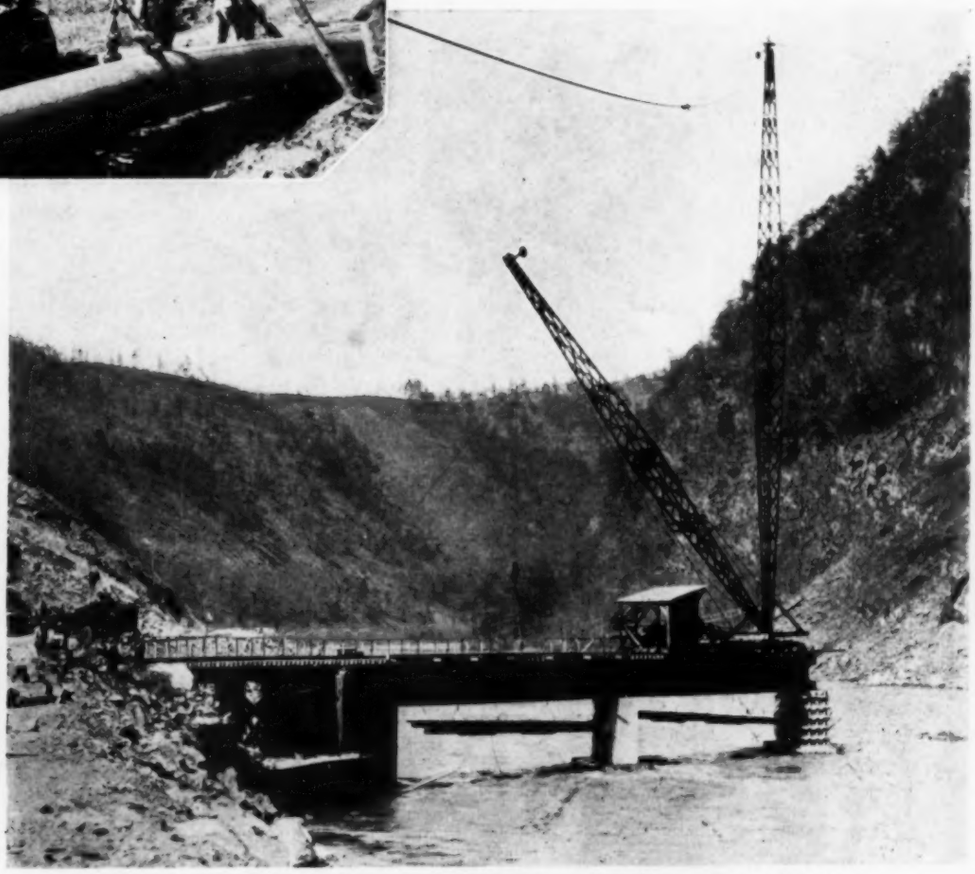


Photos from
DAVID J. WHITE,
General Manager,
Bay State Dredging & Contracting Co.

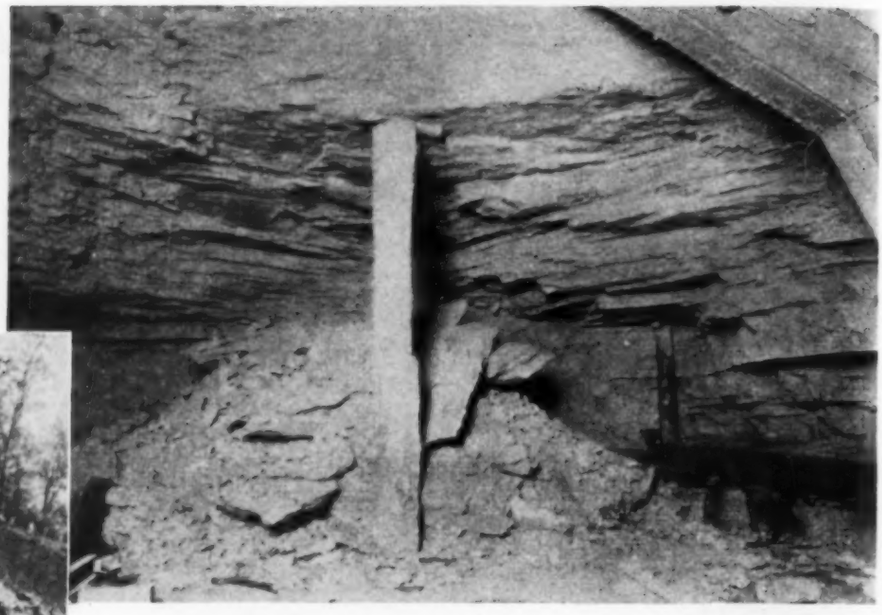
HANDLES FOUR PIPE LENGTHS in single lift. Strongback *(above and at left)* is operated from derrick barge by Bay State Dredging & Contracting Co. in laying 54-in. bell-and-spigot submarine cast-iron sewer outfall at Salem, Mass. For each section three joints are poured on wharf, and lead collar is cast around spigot of fourth pipe length. Strongback is made of steel channels, I-beam running through center, and hard pine filler pieces. Saddles are shaped to fit curve of pipe on top. Lifting chains around pipe keep section rigid while handling. Weight of four-pipe section and strongback, 26 tons.

ADJUSTABLE BOOM is attached to Caterpillar tractor by Bechtel & Palmer, contractors, for laying gas pipe line in California.

WOOD COVER protects pipe coating from damage by falling rock during backfilling of trench for Vancouver (B. C.) Water District.



SKIDDED ON RAILS TO NEW POSITION without dismantling. In building bridge for construction of Calderwood dam in Tennessee, Aluminum Company of America moved derrick by shoving base to new setup after loosening guys on one side and tightening up on others.



BAD ROCK *(right)* in north heading makes it advisable to drift in wall plates and to shoot down roof as skin-tight timbering advances.

SOUTH PORTAL *(below)* of tunnel, with heading opened to base-of-wall-plate grade.

Railroad Construction in Mountain Country—VI

Contractors on 10-Mile Norfolk & Western Branch Shoot Vertical Face of Tunnel Bench in Three Lifts

By VINCENT B. SMITH
Assistant Editor, Construction Methods

A SINGLE-TRACK tunnel 4,000 ft. long and total excavation amounting to 850,000 yd., of which 60 to 70 per cent is solid rock, are the principal items involved in the construction of the Guyandot & Tug River Railroad, a 10½-mile branch which the Norfolk & Western Railway Co. is building from Wharncliffe, on its main line, to Gilbert, in Mingo County, W. Va. W. W. Boxley & Co., of Roanoke, Va., general contractors, turned over the construction of the line to W. W. Boxley, Son & Co. This organization, in turn, sublet 2½ miles of the outside grading to two sub-contractors, Wyatt & Co., of Gilbert, W. Va., and P. C. Minotti, of Logan, W. Va.

The Guyandot & Tug River Railroad leaves the Norfolk & Western main line at Wharncliffe and ascends Ben Creek and Laurel Branch on a 1.2 per cent compensated grade for 4½ miles to the summit, where it enters the tunnel under Stagger Weed Gap. Passing through the tunnel on a tangent at a grade of —.32 per cent, the line descends Gilbert Creek on —.9 per cent compensated grade to the Guyandot River at Gilbert, where it is to connect with the Virginian & Western Railway Guyandot Line now being built down the Guyandot River from Elmore, on the main line of the Virginian Railway.

Most of the grading work is side-hill cut and fill on slopes varying from 30 to 60 deg., with some even steeper. The contractors use both well drills and jackhammers in the heavy cuts. All nine power shovels on outside excavations are steam-driven. These shovels can cast only about 10 per cent of the excavated material; the remainder must be hauled to make fills. W. W. Boxley, Son & Co. do all their hauling with railway equipment, using both narrow and standard gage. The two sub-contractors rely mainly on trucks, although they also make use of narrow-gage railways.

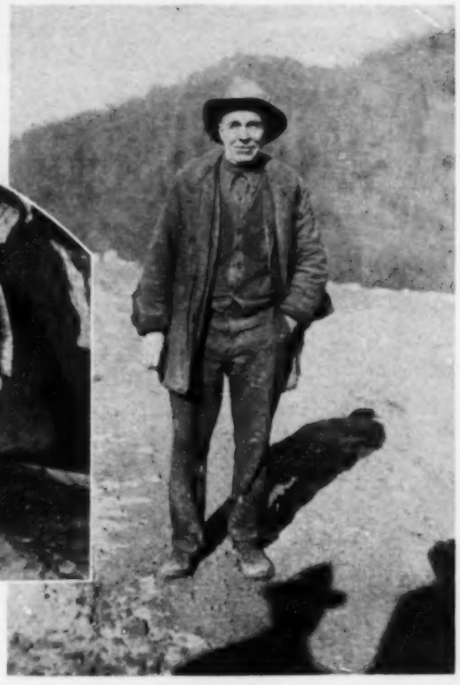
Tunnel Construction—The tunnel is the most important item in the contractors' plan of construction. Driving from both portals is being pushed in an effort to have the tunnel ready for the concrete lining as soon as track can be laid on the outside portion of the line.

The character of the rock forced the contractors to drive top headings from the very portals. In the south heading, the rock was fairly solid sandstone and slate; but, in the north heading, interlarded seams of slate and fire clay made it necessary to drift in 15-ft. wall plates one at a time.

Air Supply—A compressor plant at the south portal furnishes air for both ends of the tunnel. A 4-in. screw-pipe line extends across the mountain from the plant to the north portal. Two Ingersoll-Rand two-stage com-

F. J. WYATT, of Wyatt & Co.

C. W. FIERY *(left, below)*, resident engineer; ABNEY BOXLEY; C. D. GREER, levelman; R. L. CHAMBERS, inspector; W. A. LEWIS, of Boxley Co.; J. W. TULLOH, tunnel foreman.



S. T. WALLER, of Wyatt & Co.

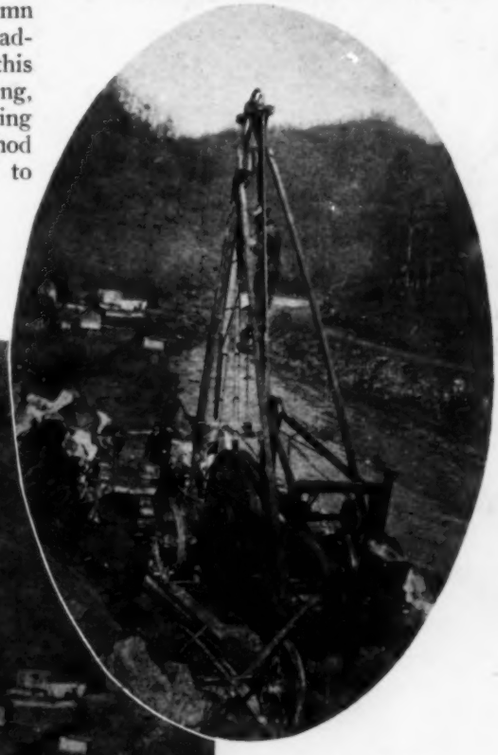
pressors belt-driven from G.E. motors supply approximately 1,600 cu.ft. of air per minute.

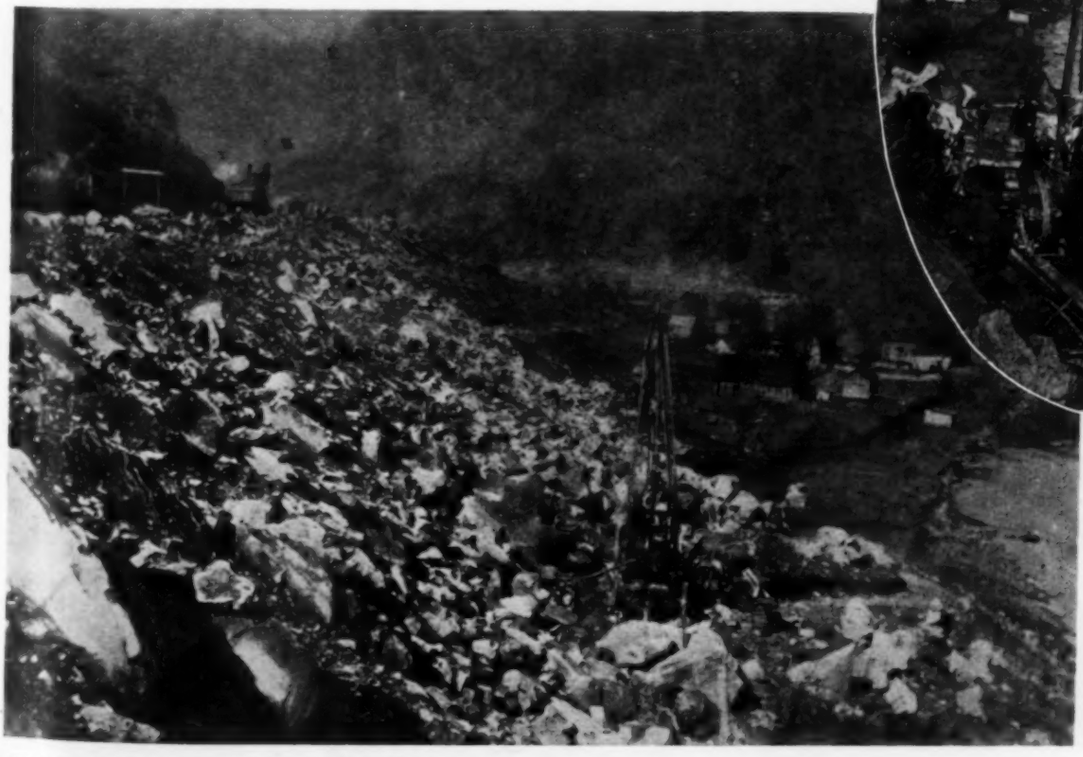
Ventilation—Sturtevant blower fans driven by 25-hp. electric motors ventiated both headings, each fan forcing a draft of fresh air through a 20-in. flue of duPont Ventube.

South Heading — Hard sandstone and slate encountered in the south heading allowed two or three rounds to be pulled in advance of the timbering. Wall plates 15 to 20 ft. long were set, and timbering for the length of the wall plates was completed, in one shift. Timber sets were spaced 3 ft., c. to c., for 1,035 ft.; on 2 ft. centers for 366 ft.; and skin tight to the north portal.

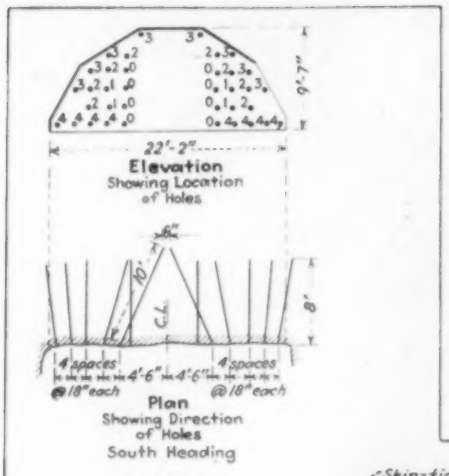
Drilling—Two Ingersoll-Rand N-75 water-jet drifter drills on column mountings operated in the south heading. As shown by the diagram, this heading was driven as a full heading, a V cut being used and the holes being drilled to pull 8 lin.ft. This method shattered the material in the roof to such an extent that the timber took weight, making it necessary to place additional rings of timber between those which had already been placed on 3-ft. centers.

Mucking — A Hoar air-operated mucking machine loaded the broken

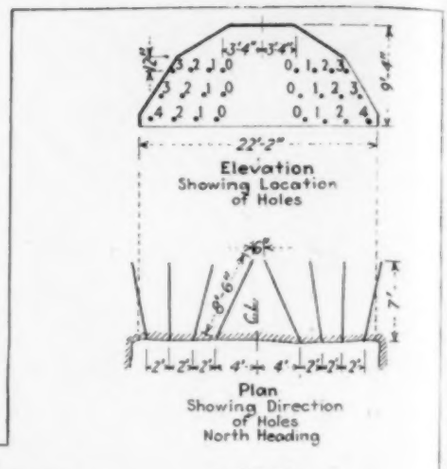


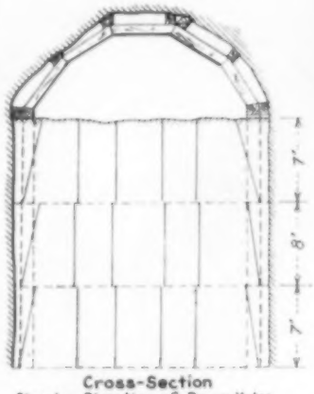


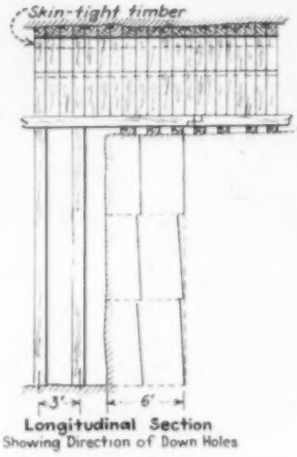
SLIDE of rock fill on hillside *(left)* is stopped by drilling through slippery, sloping layer beneath original ground surface and by blasting to break up this layer, allowing drainage of ground water. WELL DRILL *(above)* sinks eight 5-in. holes at toe of fill 20 ft. into bedrock, which lies 50 ft. below ground surface.

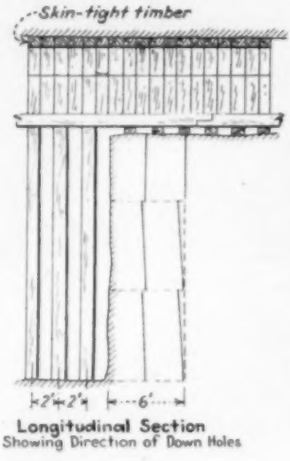


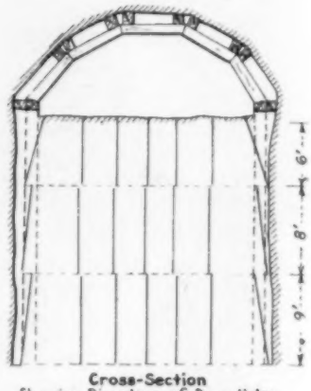
NORTH HEADING *(right)* is driven by lower heading method. Holes are drilled to pull about 6 lin.ft. and are fired by delay exploders, as numbered. Charge of duPont 50 per cent gelatin dynamite in each hole is: (0) eight cartridges; (1), (2) and (3) four cartridges; and (4) seven cartridges. BENCH OPERATIONS AT NORTH END *(below, right)*. Holes are shot in numerical order by straight shooting by day shift and by delays by night force. Holes of two upper lifts are loaded with 40 per cent gelatin dynamite as follows: front line, 3½ cartridges per hole; back holes, 4½ cartridges each, except corner holes, in which 5 cartridges are placed. In bottom lift, loading is slightly heavier, being 4½ cartridges in front and 5 cartridges in back line.

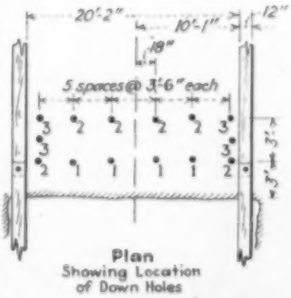




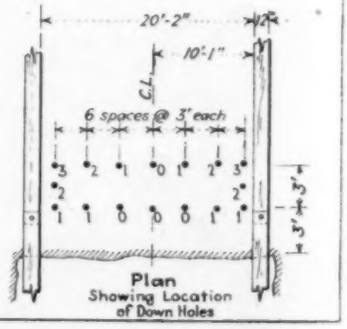








SOUTH HEADING *(left)* is driven as full heading. Holes are drilled to pull 8 lin.ft. and are loaded with delay exploders as numbered, (0) indicating direct or instantaneous shot. Each hole is loaded with Atlas 50 per cent gelatin dynamite as follows: (0) seven cartridges; (1), (2) and (3) six cartridges; and (4) ten cartridges. BENCH OPERATIONS AT SOUTH END *(below, left)*. Holes are shot in order shown. Each hole drilled in two upper lifts is loaded with six cartridges of 40 per cent gelatin; in bottom, seven cartridges per hole.



rock into J. R. Hoe & Son special 1½-yd. flat-bottom, side-dump cars. Mules hauled these cars to a small tipple at the portal.

Hauling—As the heading advanced, passing tracks were installed approximately 400 ft. apart to enable the mules to haul cars in relays. At the portal, the 1½-yd. cars dumped from the tipple into standard-gage 6-yd. Kilbourne & Jacobs wood cars with steel-lined bottoms. A 20-ton Vulcan steam dinkey hauled the standard-gage cars to the dump.

Progress—Each of two 10-hour shifts per day drilled, shot, and mucked one round. Timbering the length of a wall plate, including the setting of the wall plates, required one shift.

North Heading—Hazardous rock conditions at the north portal made tunnel driving in this heading a slower and more delicate operation. The slate and fire clay formation shattered unevenly, air-slaked readily, and sloughed seriously. For over 1,100 ft., drifts were opened one at a time to set wall plates 15 ft. in length, and the center of the arch section between the drifts was knocked out with a series of short shots.

Drilling — Ingersoll-Rand N-75 water-jet drifter drills on short columns were used to open the drifts, which were 5 or 6 ft. high and 4 to 5 ft. wide. Depending on the character of the rock, the drillers used steel 4 to 10 ft. long. Often 4 or 5 ft. of the face between the drifts fell out from the effects of air-slaking and of shooting.

In taking out the center between the drifts, the rock usually dropped several feet in advance of the holes after each slot, leaving a sloping roof. For drilling this sloping roof, the heading crews used Ingersoll-Rand S-49 jackhammers.

Horizontal holes drilled to break up the center between the drifts were 2 to 4 ft. long. After each shot, the heading crew advanced the skin-tight timbering to hold the completed arch roof.

When drifting of wall plates was no longer necessary, the crews advanced the face by the lower heading method, as shown in the diagram. They pulled the lower 5 or 6 ft. of the heading above wall-plate grade and then shot down the top with short holes lightly loaded, dropping this top material as the skin-tight timbering advanced. Often the top dropped

when the lower heading was shot. Otherwise, light shooting sufficed to drop it after mucking of the lower heading had been completed. This method proved more economical than that used at the south portal, as it required only 60 per cent of the dynamite needed in shooting the full heading. The holes were drilled to pull about 6 lin.ft.

TRUCKS dump rock on second lift of through fill.

Mucking—Broken rock was loaded by hand into 1½-yd. side-dump cars, which were hauled to the portal by mules. From the portal, a Whitcomb 6-ton gasoline dinkey pulled the cars in three- or four-car trains about 2,000 ft. to the dump.

Progress—Even when drifting the wall plates, the contractors advanced the north heading at an average rate of 3½ wall plates a week.

Excavating Bench — Air-operated Erie shovels load out the bench muck from both portals. To reduce the delays in drilling and mucking to a minimum, only vertical holes are used. The face of the bench is drilled and shot in three lifts. Jackhammer drills put down two transverse rows of holes to pull 6 ft. of a lift at one round.

As indicated by the bench diagrams, each shift shoots three lifts, leaving a full vertical face for the succeeding shift. Drilling and mucking proceed simultaneously. The two operations cease only at the time of a blast.

South End—At the south end of the tunnel each 10-hour shift drills, shoots, and mucks out 6 lin.ft. of bench and sets four plumb posts on 3-ft. centers. This work usually requires 12 hours. The holes are loaded with Atlas 40 per cent gelatin dynamite.

North End—At the north end, each 12-hour shift drills, shoots, and mucks out 6 lin.ft. of bench and sets six plumb posts on 2-ft. centers. The men work under the task system, being paid for 12 hours even though they complete the work in less time. DuPont 40 per cent gelatin dynamite is the explosive used.

All bench muck is loaded into 4-yd. side-dump cars. Gasoline dinkeys handle the cars inside both ends of the tunnel, and, at the north portal, haul them ¾ mile or less to the dump. At the south portal, where the haul ranges from ½ mile to 4 miles, the 4-yd. cars dump from a tipple into standard-gage 16- and 20-yd. Kilbourne & Jacobs and Koppel automatic air-dump cars, which are hauled to the dump by Vulcan standard-gage 40- and 55-ton locomotives.

W. W. Boxley, Son & Co. Grading Work—Three of the six steam shovels used by W. W. Boxley, Son & Co., were of the old railroad type—2½-yd. Marion 61's on standard-gage trucks. Two crawler-mounted steam shovels, an Osgood with a 1½-yd. dipper and a ¾-yd. Erie, load the earth and broken rock on the 3½-mile section just south of the tunnel. A second 1½-yd. Osgood operates north of the tunnel. All hauling is done with standard-gage and narrow-gage railway equipment. For long hauls from the heavy cuts, the contractors use two standard-gage Vulcan dinkeys, a 40-ton and a 55-ton, and Kilbourne & Jacobs and Koppel 16- and 20-yd. standard-gage automatic air-dump cars. Lighter hauling is performed by narrow-gage equipment consisting of 18-ton Vulcan dinkeys and 4-yd. Kilbourne & Jacobs and Western side-dump cars.

Heavy Side-Hill Cut—Horsepen cut, on the north end of the job, offered the heaviest side-hill excavation on the line. Of the 62,600 yd. in this cut, more than 95 per cent was solid rock.

Berms of all side-hill cuts were excavated to provide additional material for fills. Removal of the berm at Horsepen made this cut 100 ft. wide at grade. The rock was a hard sandstone stratified in thick, horizontal layers, with some slate strata included.

Rock in this cut was broken by five well-drilling and blasting operations. The first row of holes was drilled 16 ft. back from the toe of slope, and each of the remaining rows was located 20 ft. back from the face. The holes in the rows were spaced 16 ft. apart and were carried below grade.

STEAM SHOVELS AND STEAM DINKEYS move all outside excavation for general contractor. Much of railway equipment is standard-gage. Spreader is used on some fills.

On the ditch line, where the cut is 75 to 80 ft. high, the holes were drilled to 4 ft. below grade. After springing the bottoms of the holes, the powder men loaded each hole at the bottom and at two points in the barrel with a total charge of from twelve to twenty cases of 40 per cent gelatin

dynamite. Up to fourteen cases were placed at the bottom of a hole.

To Stop Sliding of Fill—A heavy side-hill fill at the north end of the Horsepen cut caused the contractors some concern by sliding seriously toward the creek. The slide did not occur in the fill itself, which was almost entirely rock, but had its origin at some distance below the ground surface. Judging from previous experience with this kind of slides, the engineers and contractors were sure that the cause of the trouble was an impervious seam of clay or other material which sloped in the same direction as the ground surface and which became slippery through the lubricating effect of ground water draining over it. The remedy for this condition is to break up the seam of slippery material to allow free drainage of ground water.

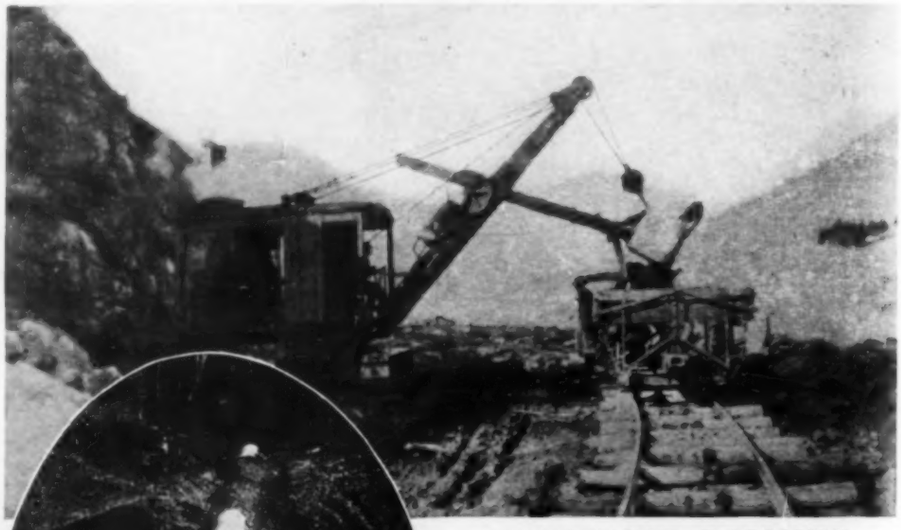
To effect this cure, the contractors put down a row of eight 5-in. well-drill holes, about 15 ft. apart, just below the toe of the fill. Bedrock was about 50 ft. below the ground surface at this point. The holes were drilled 20 ft. into the rock and were cased from the ground surface to the rock in order to save the holes in the sliding material. Bottoms of the holes were sprung with the casing in place. The powder men loaded the bottoms with all the 40 per cent gelatin dynamite that could be placed without filling any part of the barrels. From 10 to 25 cases were placed in each hole. This method of loading served to lift and break up the material composing the hillside, allowing free drainage of ground water through the impervious seam.

Wyatt & Co. Sub-Contract Section—The heaviest work on the 1¼ miles of line graded by Wyatt & Co. was in a through cut containing more than 50,000 yd. of solid rock. This cut was 130 ft. high to top of slope. The rock was solid sandstone for 80 ft. above grade; the upper strata were slate. Wyatt & Co. took out the cut in three lifts from both ends.

Drilling was done with two Ingersoll-Rand jackhammers at each end. Two Chicago-Pneumatic drills were kept in reserve and were used as needed. At each end, an Erie ⅞-yd. steam shovel loaded the broken rock into trucks.

The contractors used drill steel up to 20 ft. in length on each lift of this cut, which is 30 ft. wide at the bottom. Usually, the drillers put a row of eight holes from 12 to 15 ft. behind the face of the lift. The row of holes was loaded with six or seven cases of 40 per cent gelatin dynamite.

P. C. Minotti Sub-Contract Section—To excavate the north approach cut to the tunnel and to perform his 1½ miles of outside grading work, P. C. Minotti used one Ingersoll-Rand 9x8-in. air compressor, two Ingersoll-Rand jackhammer drills, an Erie 1-yd. steam shovel, and from two to four 2½-ton Indiana trucks.



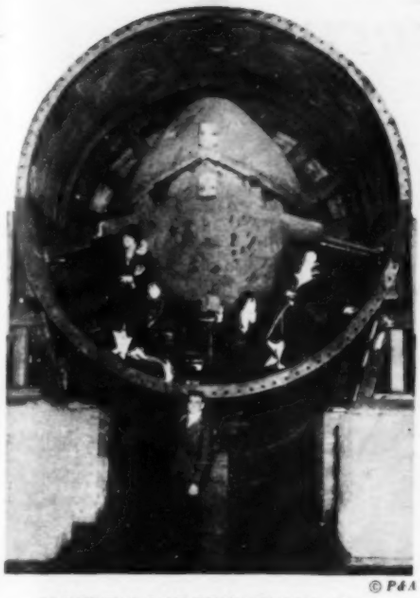
TRIMMING AND DRESSING GRADE with steam shovel and narrow-gage railway. TYPE OF HEADWALL *(left)* used with concrete pipe culverts

TWO COMPRESSORS, connected, serve either or both of 2-in. pipe lines, as needed

Progress—Construction of the line started in December, 1928. The contractors expect to finish lining of the tunnel by June, 1931.

Supervision—W. P. Wiltsee, chief engineer, Norfolk & Western Railway Co., Roanoke, Va., is in general charge, with J. W. Raitt, assistant engineer, Bluefield, W. Va., maintaining closer supervision. Two resident engineers have at different times directed field operations. Until October 15, 1929, W. A. Neff was in charge. At that time, an exchange of residencies was effected by which Mr. Neff moved to another construction project, and C. W. Fiery took charge of construction on the Guyandot & Tug River Railroad. Mr. Fiery has directed operations since that date.

For W. W. Boxley, Son & Co., Abney Boxley, a member of the firm, has charge of the south tunnel heading and of all work between the south portal and Wharncliffe. W. A. Lewis, another member of the firm, is in charge of the north heading, and of all grading work on the north end of the job. For Wyatt & Co., F. J. Wyatt and S. T. Waller direct operations. P. C. Minotti supervises the work of his own organization.



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WORLD'S LARGEST PUMP. One of nine 14-ft. diameter low-lift screw units installed for drainage at New Orleans. Capacity, 1,000 cu.ft. per second against 14-ft. head; weight, 185,000 lb. Designer A. B. Wood, of New Orleans Sewerage and Water Board, is standing in foreground.

JOB ODDITIES

A Monthly Page of Unusual Features of Construction

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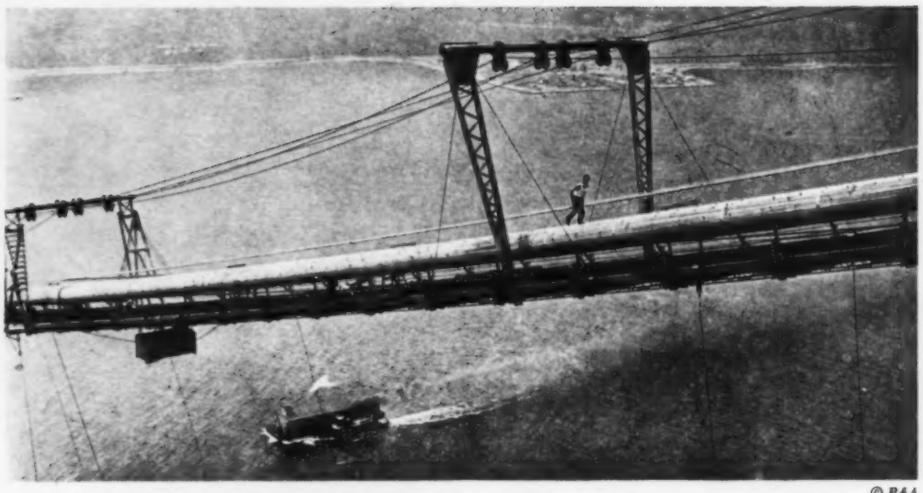
TUNNEL WITH ONLY ONE PORTAL serves Southern Pacific railway traffic on new Cascade route in Oregon. Bore is used as switchback for trains in mountainous country.



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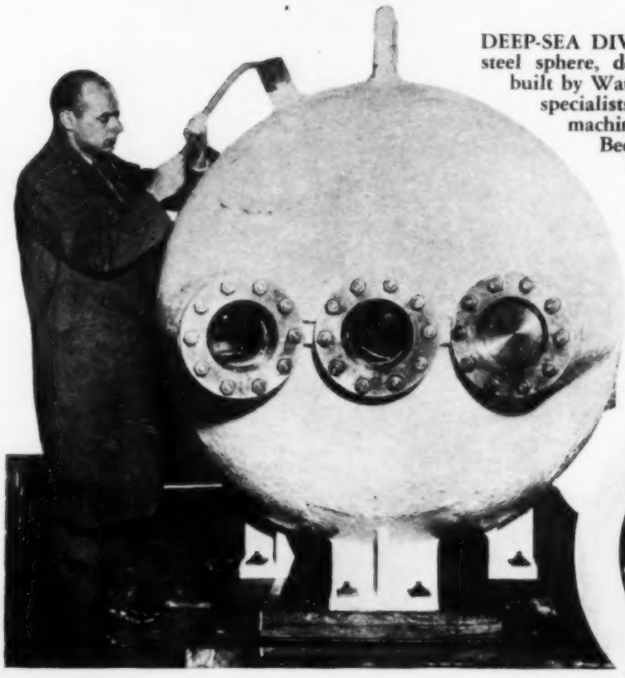
WATCH YOUR STEP! A sure-footed worker on the huge suspension bridge under construction across the Hudson River at New York selects one of the recently completed cables as a path for an early morning constitutional. No traffic congestion by this route.



DEEP-SEA DIVING BELL in form of cast-steel sphere, designed by Otis Barton and built by Watson-Stillman Co., New York, specialists in high pressure hydraulic machinery, has enabled William Beebe to observe submarine life at depth of 1,400 ft. off Bermuda coast for New York Zoological Society. The sphere is designed to reach depths of half a mile. Observation windows are of fused quartz.

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IN THE TRADITIONAL MANNER of the London bus driver who takes a bus ride on his day off, this street car spends its holiday in transit from White Plains to New York. A 28-ton Rogers trailer, hauled by a Mack truck and operated by the Gerosa Haulage & Warehouse Corp., assures a safe and speedy trip.

Welded Steel Plates Form
NEW TYPE OF FLOOR

Battledeck Type of Construction, Providing Strong, Rigid Surface, Reduces Dead Load and Headroom Requirements

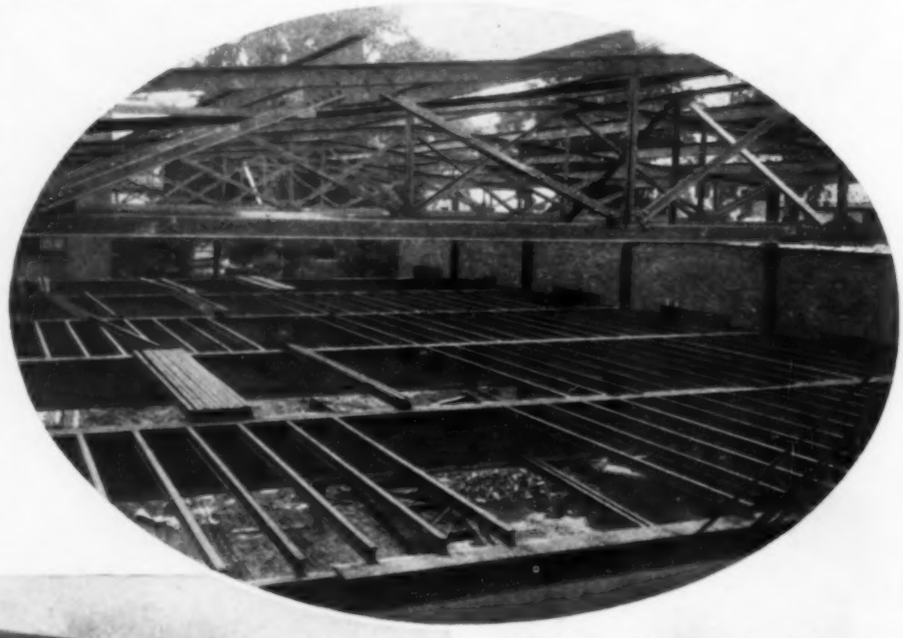
ARC-WELDED by automatic machine, a "battledeck" floor of steel plates covering 8,500 sq.ft., largest area of this new type of flooring yet constructed, has been installed in a two-story extension to the garage of the Berkshire Auto Co. at Pittsfield, Mass. Although designed for a uniformly distributed load of 135 lb. per square foot, with a deflection of 0.261 in., the floor weighs only 15.2 lb. per square foot and is economical in the headroom it requires.

The framework on which the second-story floor of the garage addition rests consists of 5-in. 10-lb. I-beams, spaced 2 ft. on centers and spanning 20 ft. They are framed flush with the tops of steel girders 33 in. deep. The steel plates are 24 in. wide and ¼ in. thick. The bottom flanges of the beams are bolt-connected to the girders through 3 x 3 x ⅜-in. angles and the webs are welded.

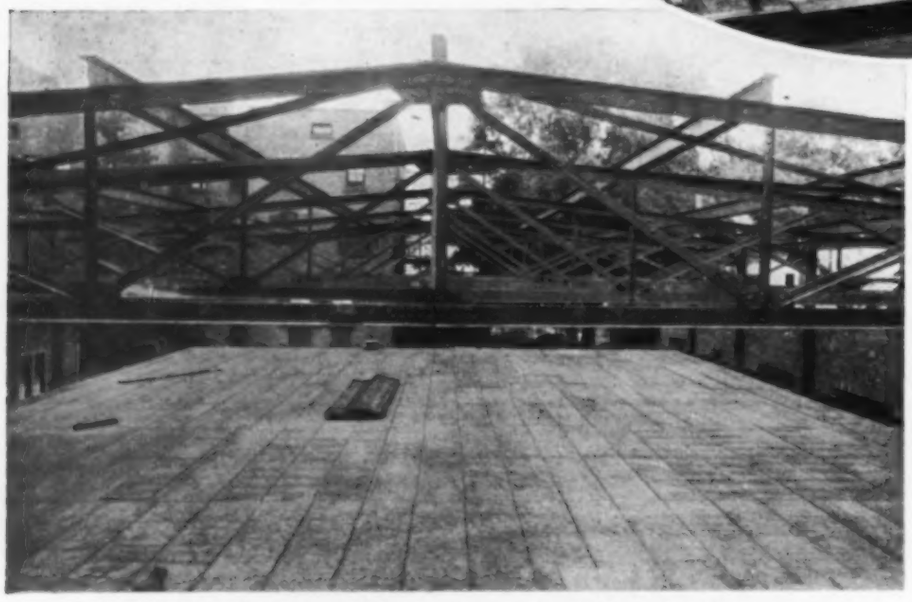
Under the supervision of George E. Haynes, architect, the Haarmann Steel Co., of Holyoke, Mass., supplied the steel and sublet its erection to Farrell & Gregory, of Pittsfield. The ¼-in. floor plates were stretched and re-squared and were delivered to the job in bundles strapped to wood timbers to prevent distortion during transit. Calculated spacing between the plates was ¼ in. Plates were first hoisted to the second floor and laid on the I-beams to provide a platform for workers in the various other building trades on the job. No movement of the plates occurred, and it was only necessary to sweep the floor in order to clear the joints for the welding operations.

Normally garages have floors built up in the center to drain water from ice-covered cars to side gutters. It was impossible to do this with the battledeck floor, so the center plate in each panel is cut out for a simple drain. This drain is connected with 1½-in. pipe on the ceiling below to the side wall, and drains to 2 ft. above the gutter of the first floor.

Although the battledeck floor can be covered with any material such as cement, rubber tile, linoleum or cork, no wearing surface is contemplated at present in the Pittsfield garage. If slipperiness develops from oil drippings, a thin surfacing of asphalt may be used.



STEEL FRAMEWORK for floor of second story consists of 5-in. I-beams spaced 2 ft. on centers and framed flush with tops of 33-in. girders.



STEEL PLATES, 24x¼-in., laid ¼ in. apart and welded to I-beams, form the covering of the floor.

Welding was done with a General Electric automatic machine on a three-wheeled, self-propelled mounting driven by an adjustable-speed motor. On the framework is a welding wire feeding device, a reel of welding wire, the travel motor and the control devices. A gas engine-generator installed on a truck on the ground below supplied, through a trailing cable, the current for welding and for operating the travel motor. An auxiliary control panel is used at the point of welding.

To hold the plates in contact and directly over the center line of the 5-in. I-beams, tack welds of from ¾ to 1 in.

spacing of ¼ in. between plates to be welded is recommended.

Various types of welds are possible, but the one used at Pittsfield was a flush weld presenting a smooth surface all the way across the entire floor. The welds not only join the steel plates but also weld them permanently to the I-beam below, making an unusually rigid joint and one which is resistant to stresses of all sorts.

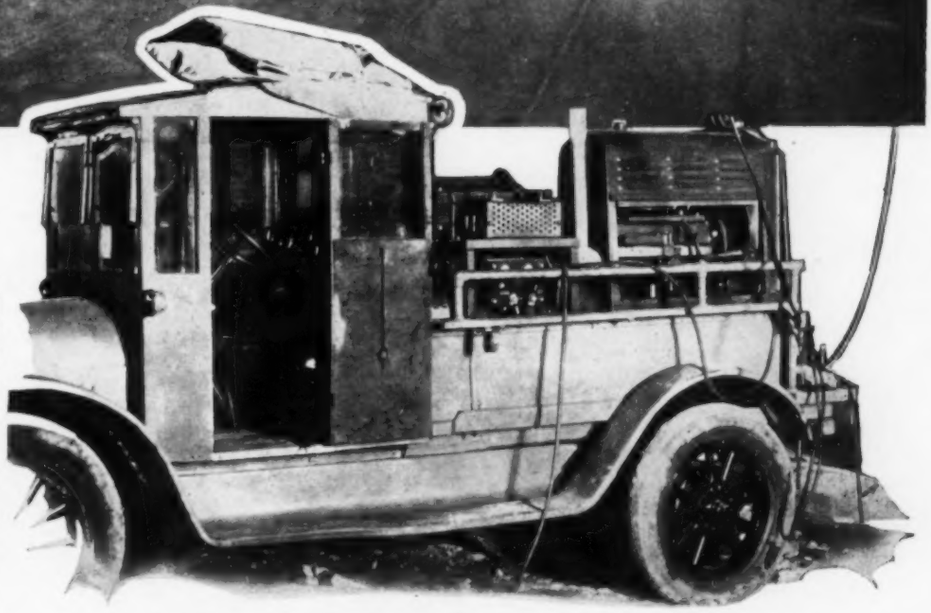
The welded battledeck steel flooring installed at Pittsfield is of the type sponsored by the American Institute of Steel Construction. It provides a storage capacity for 64 cars.

AUTOMATIC WELDING MACHINE *(left)* welds plate to plate to beam in one operation, traveling at a speed of from 6 to 12 in. per minute.

TRAVELS UNDER OWN POWER. Machine, when once started, follows ¼-in. seam accurately, using 5/32-in. electrode.

in length were placed every 18 in. starting in the center and working toward the girders. Welding of the seams was completed by the automatic machine, joining plate to plate to beam in one operation.

The machine, once started on a seam, was almost entirely automatic in operation, following the seam accurately and feeding the electrode to the weld. About 30 min. were required to weld 20 ft. of the ¼-in. seam, using $\frac{5}{32}$-in. electrode. The machine traveled at a speed which varied from 6 to 12 in. per minute. From experience gained on this job a minimum



GAS ENGINE-GENERATOR, installed on truck on ground below, supplies electric current for welding and for operating travel motor on automatic machine.

Eleventh of a series of articles on the $325,000,000 construction program for flood control in the Mississippi Valley

The Defense Against OLD MAN RIVER-XI

By ROBERT K. TOMLIN
Editor of *Construction Methods*

OF THE two types of willow mattress revetment used by the U. S. Engineer Department to protect the banks of the Mississippi River the fascine type, consisting of bundles of willows bound together with wires and cables at a floating plant, was described in last month's issue (p. 58) of *Construction Methods*. The other, or framed mattress type, involving entirely different methods of construction, on land, forms the subject of the accompanying illustrations and notes.

The framed type of mattress, instead of being fabricated on the river, is built on inclined ways on shore and when completed is launched and towed —often considerable distances—to the point where it is weighted with stone ballast and sunk. Upon parallel rows of timber frames spaced 10 ft. apart and provided with vertical posts or stanchions at 5-ft. intervals, the mattress is fabricated in 100x150-ft. sections of three layers of willows, the middle layer being laid at right angles to the upper and lower layers. After being capped with a second row of upper frames, sliding down over the stanchions, the willow layers are compressed by jacks to a thickness of 16 in. The upper frames are then securely nailed to the stanchions and after the section is launched pole stiffeners are wired to the top of the mat.

For the body of a revetment mattress willows must be at least 20 ft. long and have butts from 2 to 6 in. in diameter. For the stiffening and binding poles larger willows are speci-

Framed Type of Willow Mattress Revetment

WILLOWS for framed mattress revetment sometimes arrive by barge when local supply is depleted.

TRIMMED TRUNKS are used for the bottom and top layers and also for the stiffening poles of the mattress.

MULE TEAMS are the usual means of transporting cut willows from nearby stands to the launching ways.

BETWEEN VERTICAL STANCHIONS, extending up from bottom timber frames in 10-ft. parallel rows, floor layers of large-size willows are placed across frames.

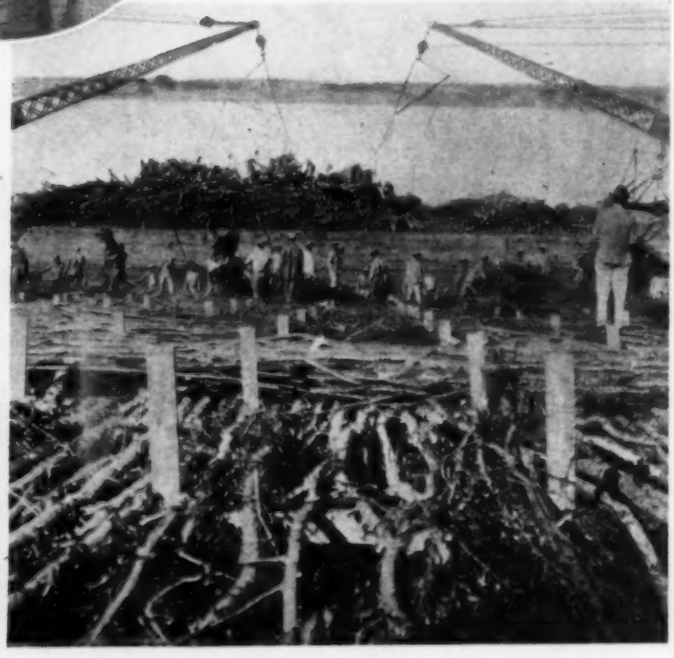
fied: 5 to 8-in. diameter butts and 22-ft. lengths. Willows must be used within 90 days after they are cut.

In building a 100x150-ft. mattress section sixteen timber frames are required. The two end frames are of 3x6-in. and the fourteen interior frames of 2x4-in. pine lumber.

The first step in making one of the bottom frames is to lay out the lumber for one of its sides in a straight line 100 ft. long and splice the pieces by nailed fish-plate joints. Then, as the spliced member of the frame lies on its flat side, 3x6x32-in. stanchions are nailed every 5 ft., except that the two outer stanchions are 18 in. from the two ends of the frame. The other longitudinal side piece of the bottom member is then nailed on, care being taken to break joints. At each joint the fish-plates are secured by four 9-in. wire nails and two 1x9-in. wooden treenails. The frame is then turned over and back-nailed. The job

CAPT. HELMER SWENHOLT, engineer in charge of revetment in fourth field area of New Orleans River District.

BOOM of barge derrick swings load of willows for distribution on launching ways.



INTERMEDIATE LAYER of willows is placed upon and at right angles to floor layer.

NAILING the members of the timber frames at upper end of launching ways.

[NEXT MONTH: Another Mississippi River article.]

large size willows is placed across and nailed to the parallel lines of bottom timber frames, the willow butts extending 2 ft. beyond each end frame. On top of this floor layer a second or intermediate layer of willows with butts smaller than 3 in. diameter is deposited at right angles to the bottom layer in sufficient quantity to give the mattress a final thickness of 16 in. when a top layer of willows has been added and the whole structure compressed by jacking a top timber frame or cap down over the vertical stanchions. The top layer willows must have 3 to 6-in. butts; they are laid in the same manner as the bottom layer.

After the timber cap has been secured by wire nails and wooden

STANCHIONS are attached to bottom frame members while lying flat on their sides.

GALVANIZED CABLE, stapled to side of frame, is extended 6 ft. on each end for mattress splicing.

is completed by nailing with staples alongside the frame at every stanchion a $\frac{3}{8}$-in. diameter galvanized wire cable 112 ft. long, allowing 6 ft. of cable to project beyond each end frame for splicing to other mattress sections.

Preparatory to placing the willow filling between the vertical stanchions the frames are laid out parallel to the line of the river on the inclined launching ways and are spaced 10 ft. apart, except at the ends, where the spacing is 8 ft.

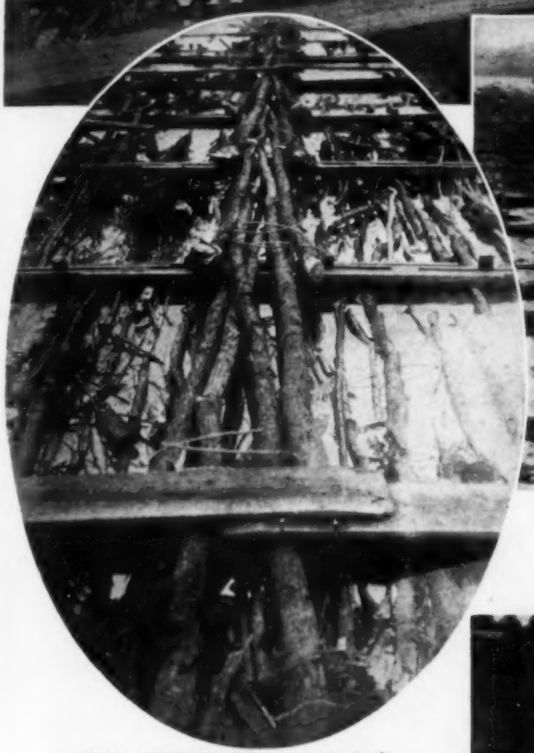
A single floor or bottom layer of

treenails to the stanchions, following compression of the willow filling, the mat is launched. Stiffening poles, 5 to 8 in. in diameter and 22 ft. long, are wired to the top frames at intervals of 20 ft. and the mat is then towed to the point where it is to be sunk.

The sinking operations are similar to those for the fascine type of willow mattress described last month. With the aid of mooring barges the 100x150-ft. sections of mattress are spotted along the river bank and spliced to-

TOP LAYER OF WILLOWS laid perpendicular to intermediate layer, completes filling for mattress. Butts are extended 2 ft. beyond end frames. Mat is capped by timber frame over stanchions and compressed to 16-in. thickness by jacking.

STONE BARGE *(left)* supplies ballast for sinking mattress.



POLE STIFFENERS are lashed across tops of upper timber frames of willow mattress.

PLANK RUNWAYS, extending from barge over floating mattress, carry procession of negro workers who dump wheelbarrow loads of stone ballast.

requires about 9 lb. of stone per square foot to sink a mattress and an additional 7 lb. per square foot to hold it securely in place on the river bottom. Successive mattresses must have an overlap of at least 10 ft.

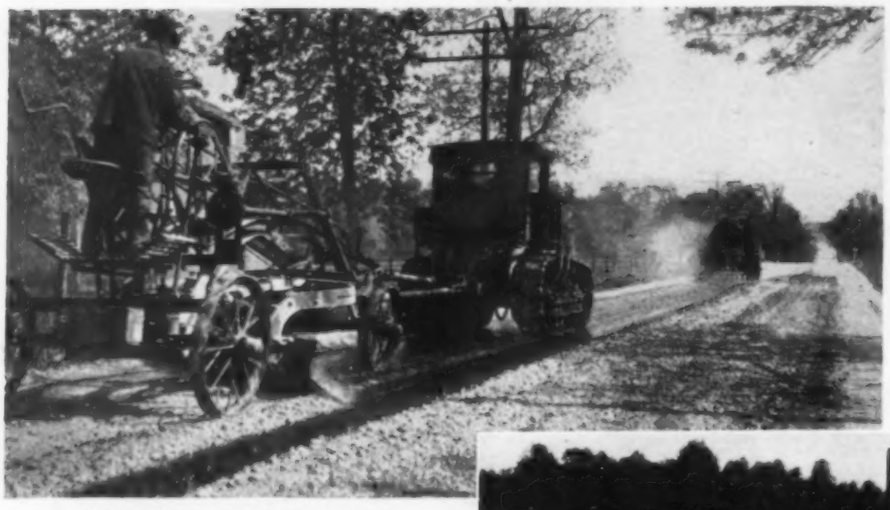
The operations illustrated herewith are in the New Orleans River District, Major W. H. Holcombe, Corps of Engineers, district engineer, and Capt. Helmer Swenholt, area engineer in charge.

gether, their long dimension parallel to the shore line and the lines of timber frames perpendicular thereto. Stone ballast is then deposited on the floating mat from wheelbarrows trundled over plank runways extending out over the mat from barges. It

SPECIAL JACKS, located over stanchions and top frames squeeze the mattress to a thickness of 16 in.

AFTER LAUNCHING the completed mattress is fitted with pole stiffeners and towed down the river to the place where it is to be sunk.

Indiana Reclaims Old Roads With
BITUMINOUS RETREAD TOP



ROAD OIL, of sufficiently heavy grade to cement loose aggregate and hold it in place after a few days' drying, is applied to gravel to provide base for retread top.

A BITUMINOUS retread top for old pavements that have become objectionable because of roughness and disintegration is widely used by the Indiana Highway Commission, which has found this type of surfacing to be economical and easily maintained.

This type of surfacing consists of several applications of bituminous material to a layer of crushed stone, slag or gravel spread over the old road and kept smooth and uniform by the use of a grader or planer until it hardens sufficiently to compact under a roller. The surface voids that cannot be closed by rolling are filled with $\frac{3}{4}$-in. aggregate previous to the third application of bituminous material.

Preparing the Base — The bituminous retread top may be placed on any kind of old road strong enough to carry the load that is to go over it. The old roads may be leveled and strengthened economically by applying metal the preceding fall, winter or early spring to be compacted by traffic or drags or by the use of a roller and

ROAD DRAG, 32 ft. long, levels loose aggregate treated with oil to provide a smooth base on which to place new surface. Superelevations and depressions are built up by successive applications of loose gravel or stone and oil.

POT HOLES developed under traffic are patched with road oil and gravel. Oil is poured into hole and covered with loose gravel.

AGGREGATE FOR RETREAD TOP is dumped from trucks upon completed base. Low cost of this type of surface is largely due to use of machines for spreading and leveling operations.

stone screenings added to coarse aggregate, as in waterbound macadam surfacing.

The cheapest method of building and leveling the base, according to A. H. Hinkle, superintendent of maintenance for the commission, is to cover the old surface with from 1 to 3 in. of loose aggregate (sized for ordinary drag maintenance) and treat it with ½ to ¾ gal. per square yard of 40 to 70 viscosity road oil. Graders, planers and long base drags make of this oil-gravel mixture a smooth, strong base which sheds water and breaks up the capillary attraction from the road base into the top course.

TRACTOR AND GRADER level the stone preparatory to application of bituminous material. Workmen in background are trimming edges and leveling up.

Surface Application — When the base is ready, 1½- to 2½-in. or ¾- to 1½-in. size aggregate (the coarser size being preferable) is spread on it and leveled with graders, drags, maintainers and harrows. Harrowing is necessary if the aggregate contains much fine material. A certain amount of hand finishing also is needed, such as trimming the edges and "spotting up" the low places. The cheapness of this type of surface is largely due, however, to the elimination of hand labor wherever possible.

Bituminous Material — The bituminous material is applied to the aggregate in three applications, the total amount required, as well as the amounts used in the different applications, varying with the depth of aggregate and the hardness of the stone. Indiana limestone, for instance, requires 0.4 gal. of bitumen on 3½ in. of loose aggregate for the first application, 0.3 gal. for the second and 0.3 for the third, an 0.2-gal. surface treatment being applied before the following winter.

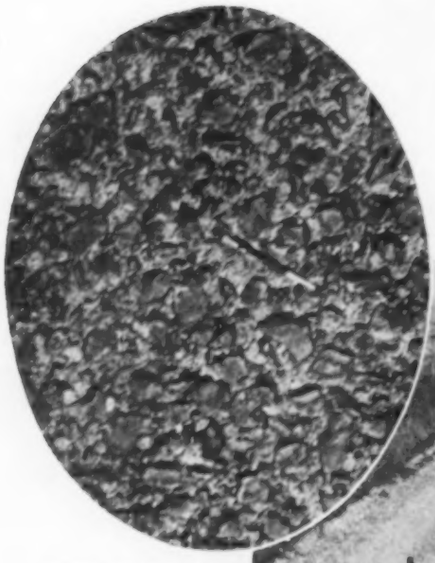
HARROWING RETREAD, after application of asphalt, in order to coat all stone thoroughly before rolling.

BLADING sometimes follows harrowing in order to assure a smooth surface for rolling.

CARPET ATTACHED TO TRUCK brushes covering material into voids just preceding third application of asphalt.

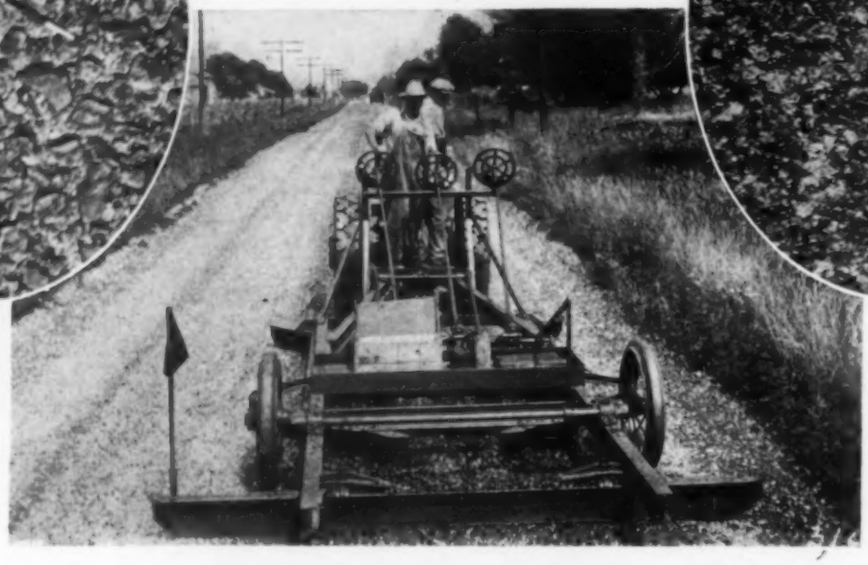
Grades of Bituminous Material — The most common bituminous material used by the Indiana Highway Commission in this work is liquid asphalt (CB), a cut-back asphalt with specific viscosity 150 to 200 at 122 deg. F., and tar (TM), with specific viscosity 30 to 60 at 40 deg. C. In cool weather liquid asphalt (AC), viscosity 50 to 100, is used. The lighter bitumen makes the aggregate more susceptible to mixing and leveling with grader or planer. In warm weather, however, the heavier grade of asphalt will give quicker results at slightly less cost.

Two methods of manipulation are followed after the first application of



BITUMINOUS RETREAD TOP which required another treatment before winter season.

DRAGGING COVERING MATERIAL *(below)* after third coat of bituminous material has been applied. This process rolls coated stones until they drop into the voids and fill any irregularities of surface.



FINISHED RETREAD surface showing voids in coarser aggregate filled with bituminous coated covering stone.

bituminous material. The first consists in harrowing and blading the coarse aggregate after the first application of bitumen so as to coat all the stone thoroughly before rolling. In the second method the harrowing and blading operations after the first application of bituminous material are omitted.

Applying the Covering—Just preceding the third application of bituminous material, the covering stone is applied, either direct from a truck or by hand. Voids may be filled by a brush or carpet attached to a Ford car or light truck. The third coat of bitumen then is applied and the surface is dragged with a drag or maintainer.

Rolling—After each application of bituminous material, the surface is rolled with a 10-ton three-wheel roller, water being applied to the roller wheels to prevent the bitumen from sticking to them. Time of rolling is governed by air temperature, sunshine and grade of bitumen used, these three factors controlling the rate of hardening of the bituminous material. To obtain best results rolling should be started when the bitumen is sufficiently stiff to prevent the stone from being "mushed" out of shape by the roller wheels and should be continued at intervals all through the hardening process. One rolling when the bitumen is in the proper stage of curing is worth several when it is too soft or too hard.

Aside from proper leveling of the surface, the greatest precaution necessary in constructing a retread surface is against the use of too much bituminous material. It is always possible to add another coat of bitumen if an insufficient amount has been applied, but impossible to remove an excess amount. The building on the surface of a thick mat of fine aggregate rich in bitumen also should be avoided as such a condition is liable to result in the "waving and rolling" of the surface in later years.

BITUMINOUS RETREAD SURFACE of one of northeastern Indiana's lake district highways.

SAFETY MEASURES on Dunes Highway. Light bituminous retread constructed to a width of 4 ft. on either side of road replaces shoulders of sand.

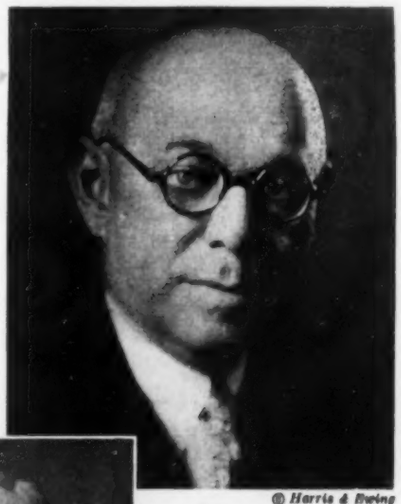
Present and Accounted For—

A Page of Personalities

FIVE BROTHERS ON ONE JOB. Members of Harrington family *(left to right)* Ed, Frank, Jess, Jim and Rel, hailing from Louisville, Ky., form a fast-working steel erecting team for the Overland Construction Co., sub-contractor on the 48-story Carew Tower in Cincinnati, Ohio, for which Starrett Bros., Inc., are general contractors. On this building the Overland organization hung up a record of setting 15,000 tons of steel in 61 working days.

J. C. BAXTER, for many years vice-president of A. Guthrie & Co., Inc., of St. Paul, Minn., has resigned to become a member of the newly organized firm of Carey, Baxter & Kennedy, contractors and engineers, New York. Mr. Baxter took a prominent part in building the 8-mile Cascade tunnel for the Great Northern Railway.

A CENTURY OF BUILDING. The Hay Foundry & Iron Works of Newark, N. J., a name linked with the structural steel-work for many noted skyscrapers, has just celebrated the hundredth anniversary of its entry in business. *(At left)* James Bruce Hay, founder and *(below)* J. Lewis Hay, his grandson, now president of the organization.



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M. A. CORROALLES *(above)* chief engineer of roads and bridges, Havana, Cuba, is new head of Pan-American Division of the American Road Builders' Association.

ESTIL A. GAST *(left)* president of Gast Construction Co., active in civic work, has been named president of the Chamber of Commerce of Warsaw, Ind.

NEW EQUIPMENT ON THE JOB

For Increasing Pay-Loads

Increasing the pay-load in highway freight operation is the advantage claimed for the new six-wheeled truck chassis that is being produced in two models by the Relay Motors Corporation, Lima, Ohio. In this chassis the Relay type of pendulum suspension

drive, by means of which the weight of the body and load is used to aid traction, is utilized. Both models are powered by a 6-cylinder, removable L-head type engine with bore and stroke dimensions of $3\frac{3}{4}$x5 and $4\frac{1}{8}$x$5\frac{1}{8}$ in. respectively and with power ratings of 33.75 and 40.8 hp. Three-point suspension is used, with force-feed lubrication.

Portable Sand Drier

To meet the necessity of rapidly heating and drying sand or stone for railway and contractors' use or for reheating pre-mixed and natural asphaltic paving repair materials, the Chausse Oil Burner Co., of Elkhart,

Ind., has developed a new type of portable sand drier or re-heater.

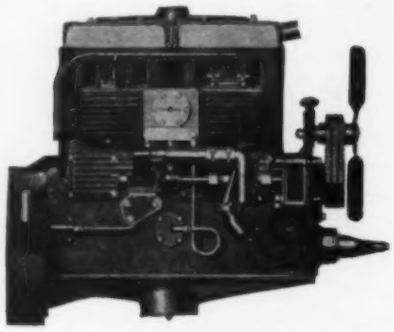
This machine consists of a rotating drum with internal cascading blades, mounted on self-aligning ball bearings and enclosed in steel housing. The drum is turned by a Le Roi single cylinder, 4-hp., radiator cooled engine with twin-disk clutch and Cotta reducing gear, through hardened roller chain.

The drier is equipped with two Chausse self-generating kerosene burners located within the steel housing underneath the rotating drum which apply heat indirectly and prevent high temperature flame from coming in contact with materials to be heated, thus causing damage or explosion.

Equipped With Oil Coolers

Metalweld-Worthington portable air compressors, manufactured by Metalweld, Inc., of Philadelphia, are now equipped with H-model Continental engines, the principal feature of which is the oil circulation system.

The dry sump system is used in this engine. An aluminum oil reservoir is mounted high on the side of the engine block. This reservoir is provided

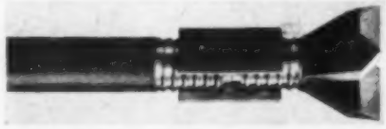


with a series of cooling fins and is located directly in the path of cool air from the fan. Oil collected in the pan is forced up into the reservoir where it passes through a metallic disk filter which frees it of foreign matter and prepares it for re-circulation. This process reduces temperature of oil as much as 35 deg. F.

Detachable Bit

Abrasion and fatigue resistance, cutting ability and shock absorbing qualities are all combined in the Thurston detachable bit and drill rod assembly now being marketed by the Detachable Bit Corporation of America, Jersey City, N. J.

By making the cutting head, or bit,

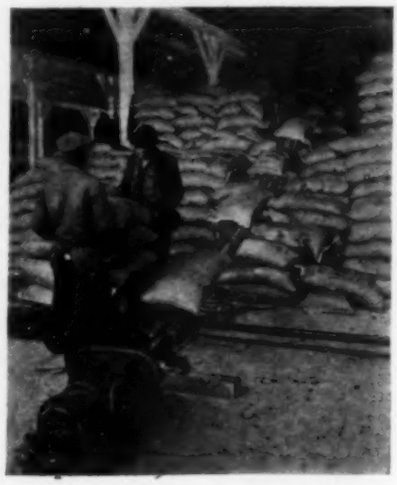


a separate unit from the drill rod and joining the two by means of an effective coupling, each part of the Thurston assembly is made of the type of steel best suited to its particular work.

Bits are furnished in three styles and in $\frac{7}{8}$-, 1- and $1\frac{1}{4}$-in. sizes. They may also be used with old style drill steel.

New Type Conveyor

A conveyor which should be of interest to contractors and manufacturers handling cement in bags is the Clark "TwinVeyor" which is being mar-



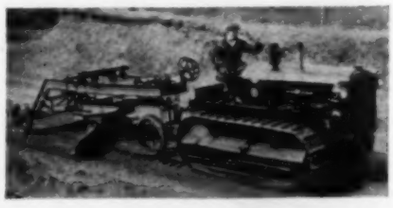
keted by the Clark Trucktractor Co. of Battle Creek, Mich.

This machine, according to its manufacturer, uses a new principle. Two external spiral tubes turned toward each other by a power head enable anything placed on them to travel forward rapidly perfectly balanced.

A standard unit consists of six 8-ft. dual sections and a power head and can be assembled or dismantled in 6 min. Any number of 50-ft. units may be hooked together to form a line.

One-Man Graders

Two new one-man graders have recently been adapted for use with the Allis-Chalmers Monarch 35 tractor by the Shaw-Enochs Co., Stillwater,



Minn. One of these is suitable both for maintenance and construction, while the other is adapted to heavy maintenance and scarifying.

A feature of this grader is its reversible controls, which may be placed in front within easy reach of the seat when the grader is being used as a one-man maintainer. For use as a two-man unit the blade controls can be transferred to the rear of the grader.

UNIVERSAL
Crane Service Companies . . .

Can help you finish up rush jobs . .

IT'S EXPENSIVE to carry over jobs until spring. Right now is the time to rent a Universal Truck Crane to help you out. You can use it when and where you want it, and for only as long as you need it.

Universal Crane Service Companies have machines ready to go, with skilled operators, available at reasonable rentals. Get in touch with the nearest Crane Rental Service Company or write to us for information.

Universal Truck Cranes for:

Loading and unloading cars
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Digging bridge abutments

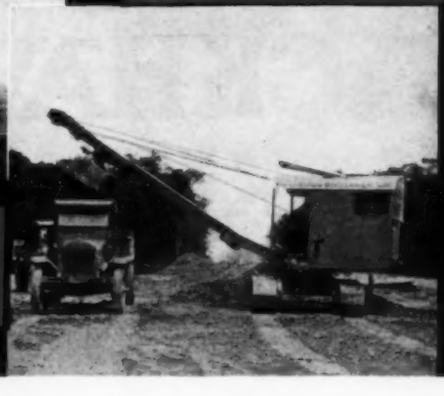
and 101 short crane jobs.

THE UNIVERSAL CRANE COMPANY
Lorain, Ohio

[illegible] tons of steel erected in 4½ days at Crane Service rental cost of $281.00.

UNIVERSAL

The Universal 35 ¼ yd. machine mounted on the Thew 2-Speed Center Drive Crawler.



Ditching and berming, cleaning up surplus dirt costs less when handled with Universal Truck Cranes.

Universal Truck Crane with ½ yd. clamshell digging bridge abutment.

SPEED UP REPAIRS ON TRUCKS AND CONSTRUCTION MACHINERY

No. 14B Set

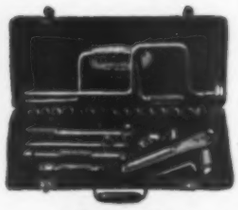
Blackhawk "Chief" tools lower servicing costs

—because they permit faster and better work. These de luxe socket wrenches have three advantages found in no others:

First, a great "Lock-On" convenience that saves time. Second, a guarantee against cracking, rounding out or wearing out. These lifetime wrenches are made of chrome-vanadium steel. Third, a finish that will not rust — glistening chromium.

The set shown — No. 14B — has fourteen powerful heavy-duty handles and sockets for quick, accurate repair and assembly jobs. Other sets for every need — we are the world's largest manufacturers of socket wrenches. *See your dealer. Mail coupon to us.*

BLACKHAWK MFG. COMPANY . . . *Milwaukee, Wis.*
Also manufacturers of Blackhawk Hydraulic Jacks



30 CD Set

A great general utility set. Thirty glittering sockets and handles in compact steel case. An ideal assortment for handling a wide variety of work. Patented features — better tools.

26 KD Set

A super-useful combination set. Contains sixteen "Chief" Socket Wrenches and ten Blackhawk-Armstrong Open-End Wrenches. Silvery tools of immense strength, but lighter and easier to handle.

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Send literature on truck, shop, and industrial ☐ socket wrenches ☐ open-end wrenches ☐ hydraulic jacks.

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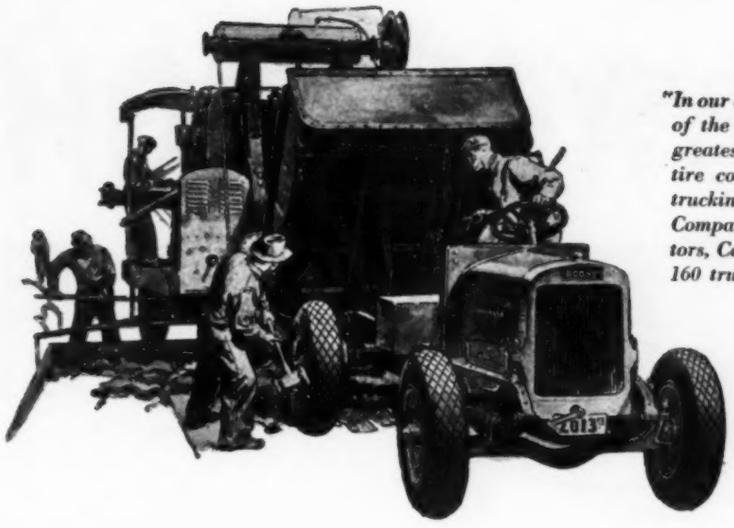

"In our opinion the general adoption of the balloon tire will effect the greatest saving in maintenance and tire costs in the history of motor trucking," says The A. G. Boone Company, Motor Trucking Contractors, Columbia, S. C. They operate 160 trucks in five southern states.

"Balloons *stayed on top—high pressure tires bogged,*"

says the report on these road building operations. Now the whole Boone fleet is on Goodyear Truck Balloon Tires. After one grueling year the original set looks good for "six to ten months' additional service." They have already exceeded the normal mileage of high pressure tires almost 40%. In accurate tests they have cut gasoline mileage costs 6¼%. Wouldn't it pay to find out what

GOODYEAR TRUCK BALLOONS

can do for you?

These great new tires pioneered by Goodyear stand up under high speed operation, reduce truck maintenance costs, give more powerful traction, new safety, lower tire costs.

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"As Easy as

Curing a Concrete Road!"

A PERFECTLY apt and commonplace statement now that proper curing of concrete roads is only a one-man job.

Few ways of making jobs easier and making results better have marked such an advance as that of the Calcium Chloride methods over the older methods of curing concrete.

Where surface curing is used, one man with a spreader replaces the big gang required by the old ponding and covering methods. And where Calcium Chloride is used as an admixture, road curing becomes next to no job at all.

Both Calcium Chloride methods get rid of the need for constant sprinkling and inspection. Both eliminate the need for the "final clean-up." Both methods have earned a reputation for turning out perfect road curing jobs and have won the approval of the United States Bureau of Public Roads.

Method of curing concrete by the use of Calcium Chloride on the surface or as an admixture are both approved by the United States Bureau of Public Roads.

Look into the facts for yourself. Write to any of the companies listed here and ask for booklet **342.**

CALCIUM CHLORIDE PUBLICITY COMMITTEE

THE DOW CHEMICAL COMPANY - - - - - - - - Midland, Michigan
SOLVAY SALES CORPORATION - - - - - 61 Broadway, New York
THE COLUMBIA PRODUCTS COMPANY - - - - - - Barberton, Ohio

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CALCIUM CHLORIDE

CURES CONCRETE

The NORTHERN KING

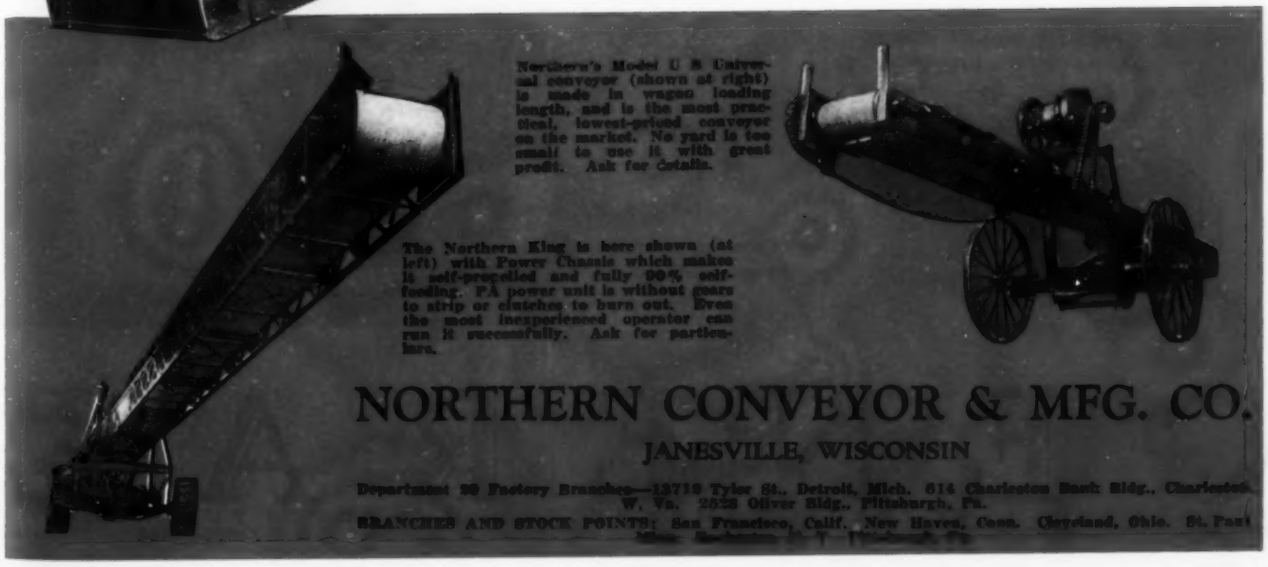
BEST Belt-Type CONVEYOR Money Can Buy..

Northern King Conveyor meets every test. It handles a greater capacity and larger material without spillage than most other conveyors. The rigid frame will bear more weight than any other conveyor frame made. It will not twist and is practically indestructible. The conveyor, like all Northerns, is so well balanced that one man can easily lift the loading end and move it around easily. The best that skill can make and money can buy.

Equipped with 24-inch belt, 16 ft. to 70 ft. lengths. Send for complete details and prices.

Over-Night Service

Northern's extensive organization of service stations places one within easy reach of every Northern patron. Parts supplied within 24 hours, saving expensive delays. The value of this co-operative effort of Northern cannot be over-estimated.



Northern's Model U 8 Universal conveyor (shown at right) is made in wagon loading length, and is the most practical, lowest-priced conveyor on the market. No yard is too small to use it with great profit. Ask for details.

The Northern King is here shown (at left) with Power Chassis which makes it self-propelled and fully 90% self-feeding. PA power unit is without gears to strip or clutches to burn out. Even the most inexperienced operator can run it successfully. Ask for particulars.

NORTHERN CONVEYOR & MFG. CO.

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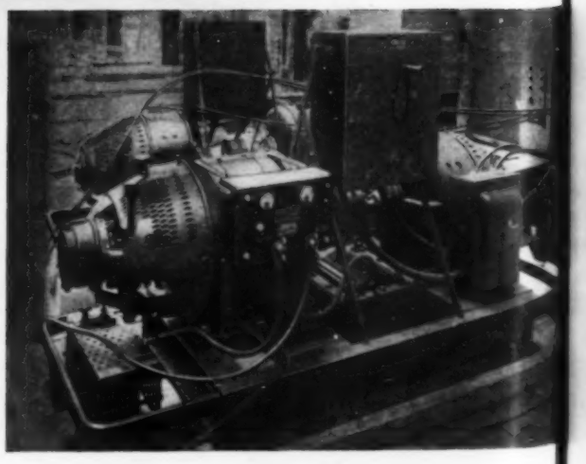
IT'S HERE!-

The hooded figure of the electric arc welder symbolizes the silence and efficiency of this new, quiet method of erecting steel structures



Two of the sets used to supply the arc-welding current

GENERAL

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

--NOISELESS
Building Erection

Silently

efficiently, a 14-story office building is rising on famous Tremont Street in Boston. It is the new arc-welded home of the Boston Edison. Office dwellers and shoppers on the street gaze in gratified amazement at this magic of noiseless building erection. The first big step in the reduction of urban noise has been made.

The Edison Electric Illuminating Company of Boston is to be commended on this progressive, pioneering step—for, although the steel is being shop-riveted, field erection is being accomplished solely by arc welding.

Aside from the boon of quietness to hospitals, hotels, and office workers, this new noiseless method of building erection offers so many engineering advantages that a number of recent we'ding bids have been actually lower than those covering riveted construction.

In your investigation of the possibilities of arc-welded construction you will find the General Electric Company a well-prepared headquarters for equipment, advice, engineering assistance, and data. These facilities are at your disposal through a nearby G-E sales office.

Architects . . . Bigelow, Wadsworth, Hubbard & Smith

Steel fabrication . . . W. A. & H. A. Root

Engineering . . . Whidden-Beckman Engineering Co.

Consulting Welding Engineer . . . Frank P. McKibben.

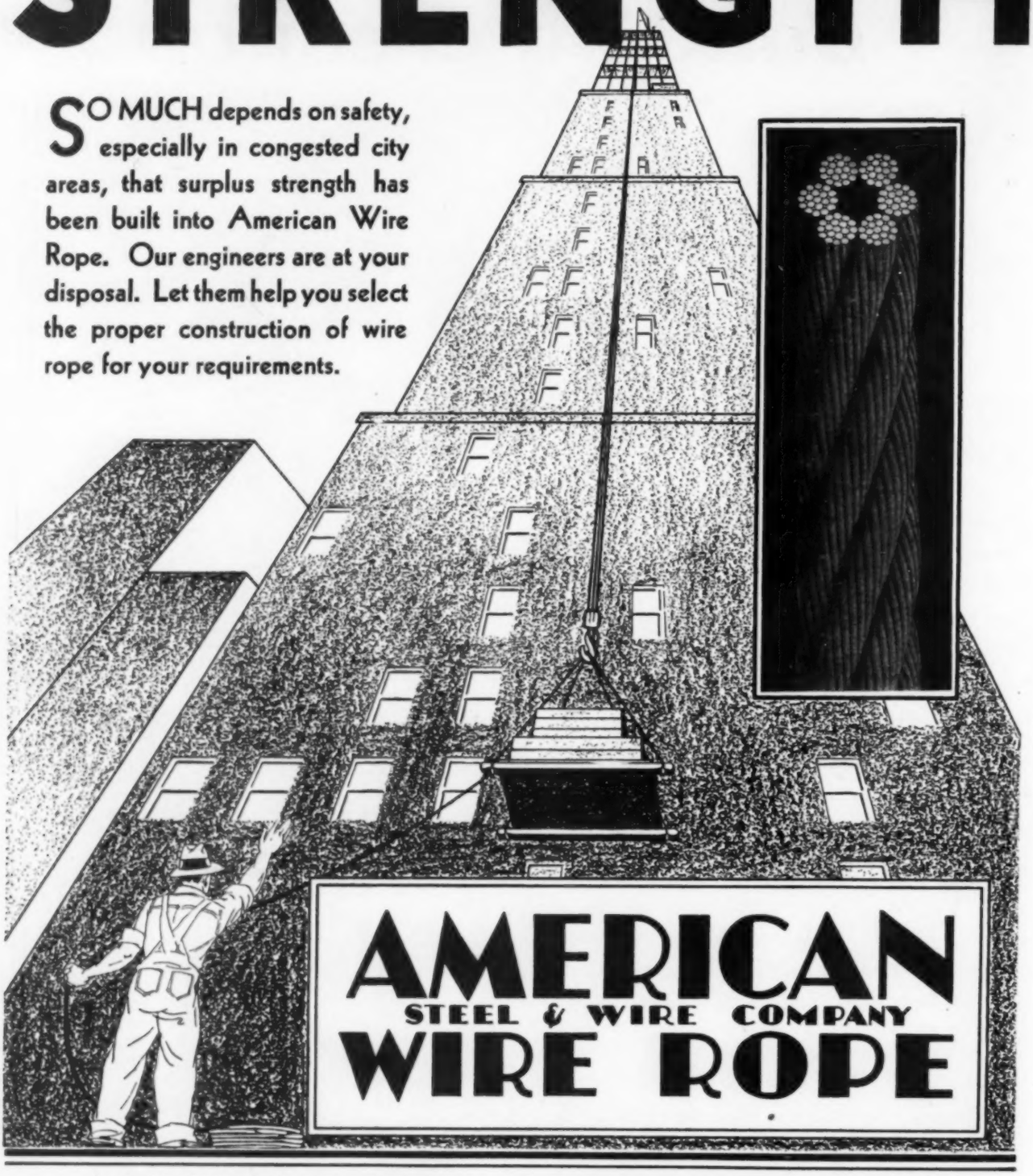
530-93

ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

STRENGTH

SO MUCH depends on safety, especially in congested city areas, that surplus strength has been built into American Wire Rope. Our engineers are at your disposal. Let them help you select the proper construction of wire rope for your requirements.



AMERICAN STEEL & WIRE COMPANY

SUBSIDIARY UNITED STATES STEEL CORPORATION

208 S. La Salle Street, Chicago

Other Sales Offices: Atlanta Baltimore Birmingham Denver Detroit Kansas City Memphis Milwaukee Pittsburgh Salt Lake City St. Louis

Pacific Coast Distributors; Columbia Steel Company, San Francisco Los Angeles Portland Seattle Honolulu

30 Church Street, New York

Boston Buffalo Cincinnati Cleveland Dallas Minneapolis-St. Paul Oklahoma City Philadelphia Wilkes-Barre Worcester

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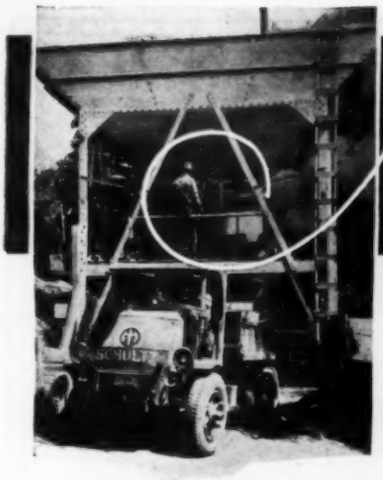


You can save *money

with

Butler *Weighing* Hoppers

*Loss of loading time, over-weighing of aggregates and inaccuracies in batching — which must be corrected — may increase the truck time at the batching plant 50% to 250%.

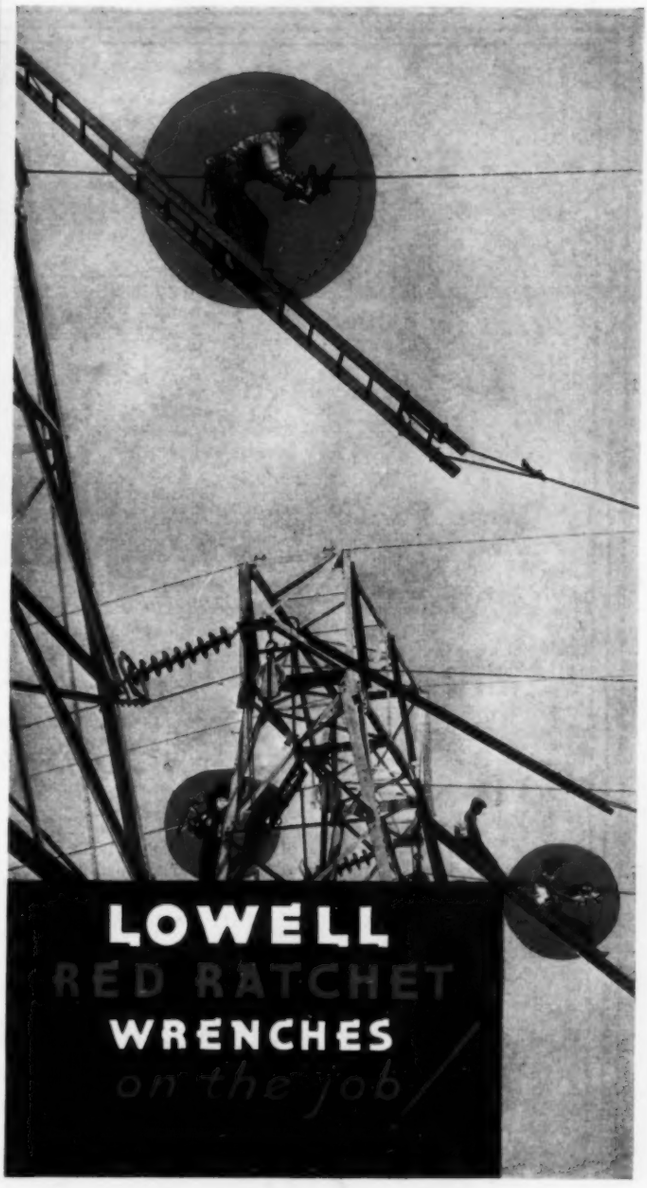
BUTLER Weighing Hoppers are made with a full knowledge of field conditions and a wealth of actual contracting experience.

Inaccuracies in weighing—and consequent losses—are eliminated by quick-operating gates and highly accurate weighing equipment. Losses in operating time and in the waiting time of trucks are reduced to a bare minimum by Banked Controls which are one-man operated.

You can't afford to eat up profits with useless handling costs. Let us tell you how Butler Bins and Batchers will cut your costs.

BUTLER BIN COMPANY
WAUKESHA WISCONSIN
Representatives in fifty cities

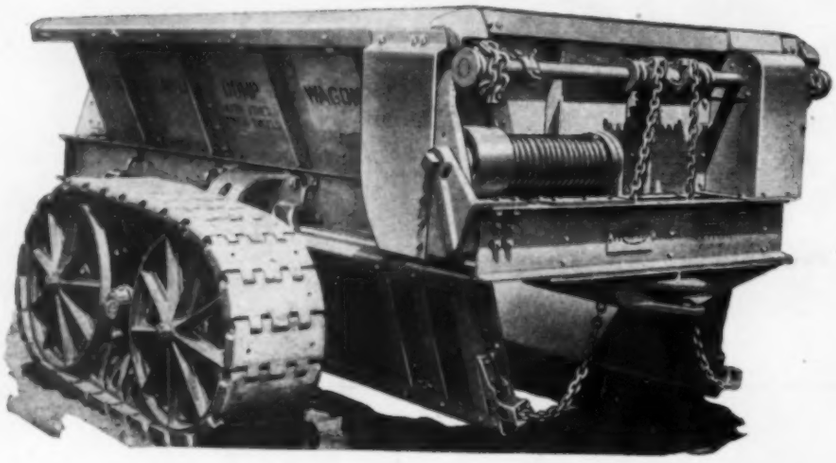
BUTLER
Steel **BINS**



UP in the air with these chaps where every ounce of tool weighs a ton in a heavy wind we find Lowell "Red Socket" Wrenches tightening "Dead End" Clamps on heavy transmission cables. Needless to say, these men require a reversible ratchet wrench built with plenty of *backbone* to stand rough usage. Lowell Wrenches are thoroughly recommended by clamp manufacturers for this work.

Send for the new complete Catalog "R"

LOWELL WRENCH COMPANY
WORCESTER — MASS.



Let the SPRING Do It
One Less Man To Pay

YOUR tractor man can dump the load and wind up the doors. So can your dump boss. Work your wagon man somewhere else and add the saving to your profit.

Order your new wagons equipped with this practical spring wind-up, or mount it on your Western Crawler Wagons in the field. It has been thoroughly tested in actual service.

The new Western spring wind-up closes the doors with a bang. Simplicity itself—fool-proof—requires no special attachment on the tractor. A single trip lever controls both dumping and closing.

Illustrated and described in Bulletin W-30-JD. Where shall we send your copy?

WESTERN WHEELED SCRAPER CO.
AURORA, ILLINOIS, U. S. A.

WESTERN

These ELECTRIC TOOLS *SPEED UP* Construction

Use Them to Save Time and Labor!

PORTABLE ELECTRIC SAWS DO THE WORK OF SIX MEN

HERE is a Portable Electric Saw that rips six times as fast and crosscuts seven times as fast as hand sawing. Ideal for all types of building work, large construction jobs, repair work, etc. Built in three sizes—6″, 8″ and 10″—ball bearings throughout, with chrome nickel shafts and gears.

Powerful Universal Motors use A. C. or D. C. Can be connected to any electric light socket. Table adjustable from 0° to 45° bevel cutting and other special sawing operations. By using the proper blade or abrasive disc these saws will also cut light metal, slate, marble, asbestos, tile, transite and porcelain.

Special safety features include an automatic telescopic guard which entirely encloses the blade and protects the operator. Complete with one rip blade, one cross-cut blade, adjustable saw fence, three-conductor cable with safety wire for grounding, and convenient carrying case with handle.

See Them at Your Distributors

½-Inch Portable Electric Drill

The Black & Decker ½-inch Drill is the most popular drill in the world. It is used more than any size of any other make. Weighs only 12½ pounds. Very easy to handle, yet so powerful that a man cannot stall it, even when drilling up to its maximum capacity in steel.

Great power plus low spindle speed make this an ideal tool for all general construction drilling up to ½ inch. Universal motor operates on A. C. or D. C.

Other Black & Decker Portable Electric Drills are available in sizes from ¼-inch to 1½-inch—for every drilling operation.

Portable Electric Hammers

Sturdily made and very powerful, yet light in weight and easily handled. Made in three sizes, suitable for drilling in brick and concrete, light steel chipping and driving wood-working chisels—wherever hammering action is needed. Remarkably fast and useful in many ways on construction jobs. Blows are struck at rate of several thousand per minute.

Fitted with Universal Motors operating on A. C. or D. C.

Electric Screw Drivers

Powerful, ball-bearing, electric tools for driving screws and nuts. Similar in construction to Black & Decker Electric Drills, except that spindle is provided with a Positive Clutch which releases screw when forward pressure on tool is relieved.

Ideal for driving any wood screw up to No. 16-inch by 3¼-inch long in hard wood, log screws up to 5/16-inch by 4-inch long, and nuts on bolts up to ⅜-inch diameter. Built for convenience in handling. Driven by Universal Motors.

Your Jobber Has Them!

BLACK & DECKER

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Slough, Bucks., England — Toronto, Ontario, Canada — Sydney, Australia

Mail This Coupon for Catalogue

The BLACK & DECKER MFG. CO.
Towson, Maryland, U. S. A.

Please send me your catalog showing the full line of Black & Decker Portable Electric Tools. I am particularly interested in:

Electric Saws — Electric Drills
Electric Screwdrivers — Electric Hammers

Name.....

Address.....

Distributor's Name.....

Heavy-Duty! Autocycle!
KOEHRING

THE KOEHRING still is, as it has always been, the Heavy Duty Paver.

—and now the Koehring Autocycle synchronizes high speed actions into a positive sequence of operations that sends materials into drum and concrete on the subgrade with no possibility of lost motion. It sets the *pace* for the whole job! It's a consistent, ever-alert money-maker.

Know the Heavy Duty Koehring! Know the extra yardage possibilities of Koehring Autocycle!

N. E. C. PRODUCTS

KOEHRING — Pavers, Mixers; Power Shovels, Pull Shovels, Cranes, Draglines; Dumptors. INSLEY — Excavators; Concrete Placing Equipment, Cars, Buckets, Derricks. T. L. SMITH — Tilting and Non-tilting Mixers, Pavers, Weigh-Mix. PARSONS — Trench Excavators, Backfillers. C. H. & E. — Portable Saw Rigs, Pumps, Hoists, Material Elevators. KWIK-MIX — Mixers: Concrete, Plaster and Mortar.

NEC

National Equipment Corporation

30th St. & Concordia Ave.
Milwaukee, Wisconsin

A 5910-I

Lectro molded BOOT

For excavating work.... a new boot molded in one piece like an automobile tire

Greater Ease and Longer Wear

Above—Storm King Height
At right—Short Height
Also made in Sporting Height

The Lectro Molded Boot is built by an entirely new and different method to best withstand the grinding, cutting wear of sand, rough gravel, rocks, concrete, mud, water—every kind of hard going in construction work.

This new boot is actually molded in one piece under enormous pressure that makes the rubber many times tougher than ordinary boot stock. If your supply house cannot supply you with Lectro Molded Boots, write for a pamphlet which describes fully the unique features of this new boot.

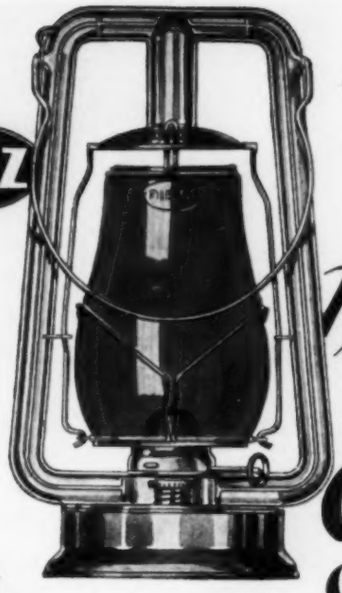
The Lectro Molded Boot is patented and made only by

HOOD RUBBER COMPANY, INC.

Watertown, Mass.

HOOD MAKES CANVAS SHOES · RUBBER FOOTWEAR · TIRES
RUBBER SOLES AND HEELS · RUBBER FLOOR TILING

DIETZ *In the Public Eye*



HY-LO

You can put Dietz Lanterns on the longer night shifts required from now on through the Winter, with no fear that their red eyes will fail to stay wide awake and give the warning that safeguards highway traffic and your own interests.

Replenish your Fall and Winter supply of Dietz Red Lanterns NOW. Dietz Hy-Lo Hot Blast is the lantern illustrated. It has the direct globe-lift favored by many contractors.

R. E. DIETZ COMPANY
NEW YORK

Largest Makers of Lanterns in the World

FOUNDED 1840

USE RED
No other color means DANGER

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Single Units or Complete Plants

Commercial Credit deferred payment plans are being used extensively in the present trend of industry to modernize factories, plants, machinery and equipment. The reason is obvious: Commercial Credit Plans allow payment from modernization's effected savings.

Modernize and save! Whether your replacement need be a single unit or a complete plant, there is a Commercial Credit Plan ready to *save* the many dollars annually lost to obsolescence.

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Commercial Equipment Corporation, affiliation of Commercial Credit Companies, provides a further financing service to industry. Its method of financing complete installations as a unit, requiring two or more varying types and makes of equipment, has been approved and endorsed by many of the country's leading engineers.

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KEMSLEY, MILLBOURN & CO., Ltd. - New York
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S.P.37

COMMERCIAL CREDIT COMPANIES, Baltimore, Maryland
Give us full information, without obligation, about Commercial Credit Plans.

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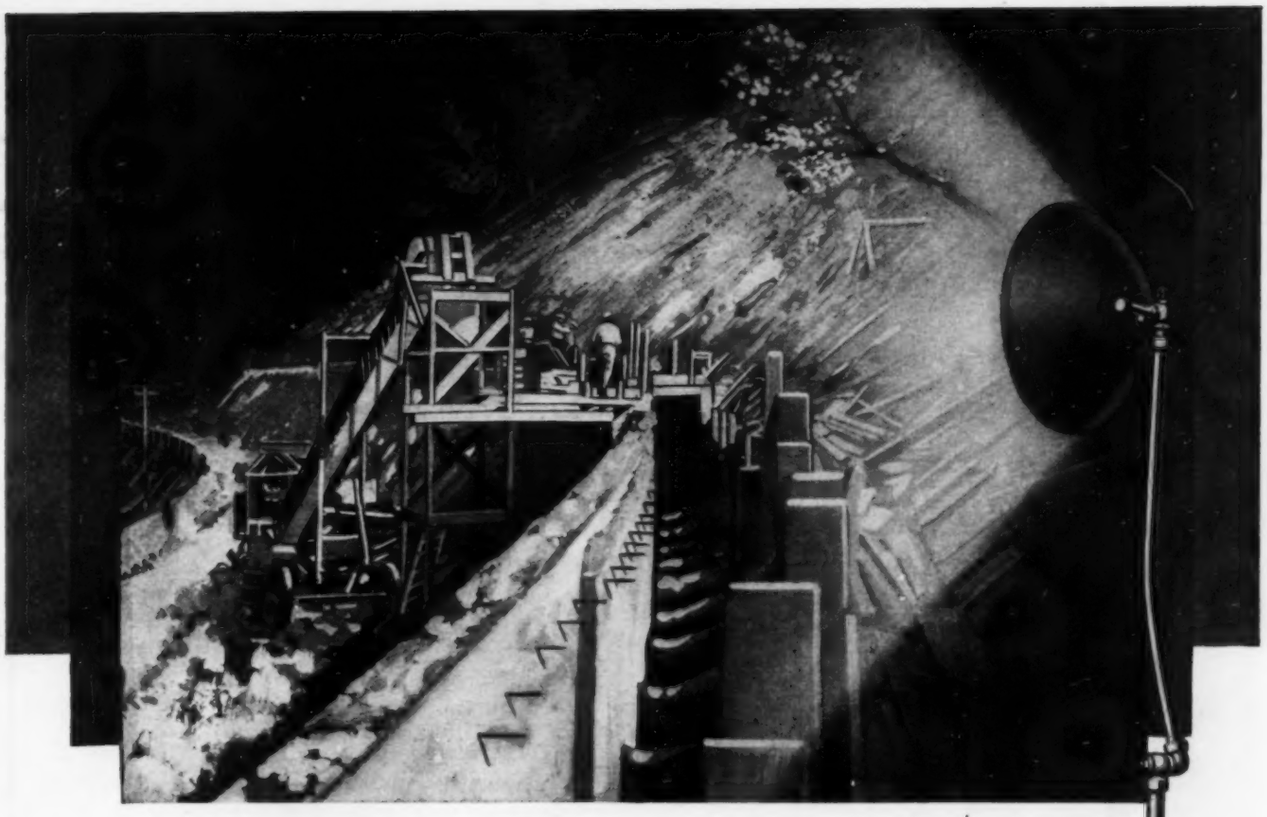

. . . . Carry Through With Carbic Light . . .

WHEN late starts, unfavorable weather, lack of materials, or any other cause of delay forces you to rush the job along—a night shift with Carbic Flood Lights will see you through.

Carbic Flood Lights enable your night shift to work rapidly and safely. Their powerful, clear white rays are perfectly diffused. There is no glare and no dark shadow. Carbic Light penetrates fog, smoke or dust. It is good light to work by.

Carbic Flood Lights are low in first cost and economical to operate. They are simple, rugged and dependable—and meet every night-illuminating requirement.

Your night shift can hustle with Carbic Light.

Carbic is distributed by the Union Carbide Sales Company through its national chain of warehouses and is sold by jobbers everywhere.

CARBIC

PROCESSED CARBIDE FOR CARBIC LIGHTS & GENERATORS

OXWELD ACETYLENE COMPANY

Unit of Union Carbide UCC *and Carbon Corporation*

NEW YORK

Sales offices in principal cities

Technical Publicity Department, Room 1201, 205 East 42nd Street, New York, N. Y. M 10-30

Without obligation, I would like to have additional information on Carbic Lights.

Name _____

Street Address _____

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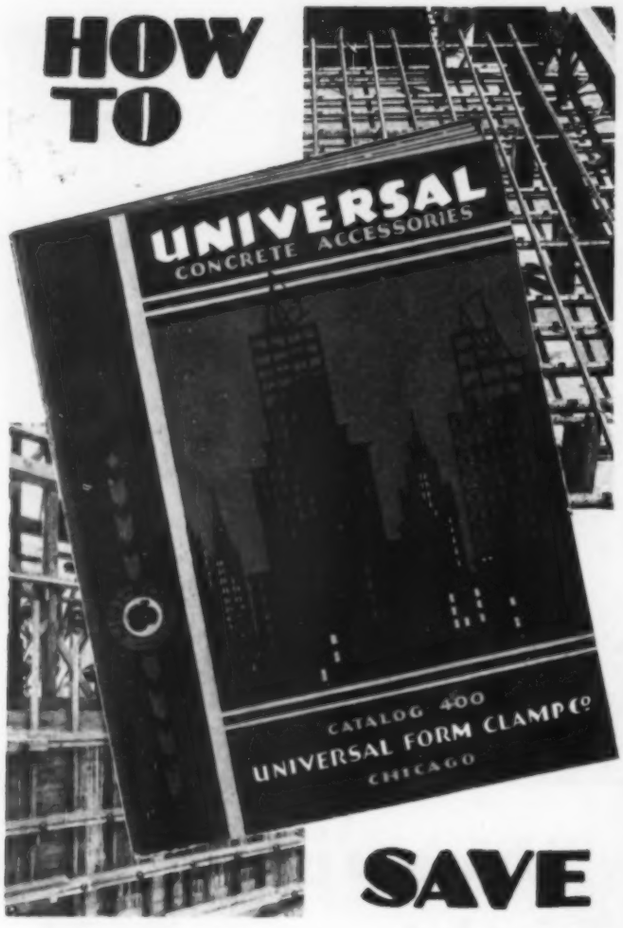
HOW TO



SAVE

The kind of data you want is included in this new book of Universal Form Clamp Co. It shows the simplest methods of handling many problems in concrete reinforcing and form-building, speeding and simplifying the work, or saving money on the job.

It shows methods that have proved best for many operations in concreting. Complete data for instance, on the designing of wall forms illustrated with charts and tables, is shown. Helpful hints and information of value to every man engaged in concrete construction are comprised in this book.

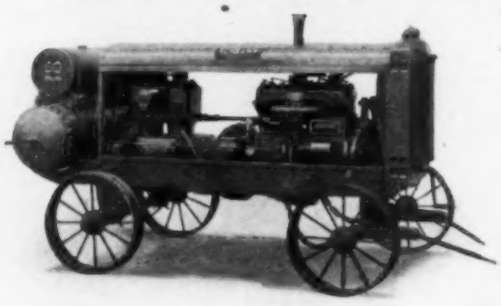
Your form-building practices can be speeded and improved, and the new UNIVERSAL book will reveal how. Free copy will be mailed to you upon request.

UNIVERSAL FORM CLAMP CO.
971 Montana Street, Chicago, Ill.
Graybar Bldg., New York City

Form Clamps	Tee and L Heads	Soffit Spacers	Screed Chairs
Adjustable Shores	Post Caps	Bar Spacers	Bar Ties

UNIVERSAL
Used by the Nation's UNI-FORM *Construction Engineers*

be . . . .
"IN THE KNOW"



Only contractors who are "up" on their equipment are the ones who are making profits due their business. Know your equipment....and get the best, the most dependable and reliable.

These features in **SCHRAMM** Air Compressors are making it the choice of large contractors the world over:

A compressor that actually delivers plenty of air.

The best and most powerful engine available is used.

Easy to start in any weather. Clutch feature permits starting the engine separate from the compressor.

Dirt cannot enter either air intake or gas line.

Engine will not race when compressor is idle. Unloader and slow-down control regulate speed of engine.

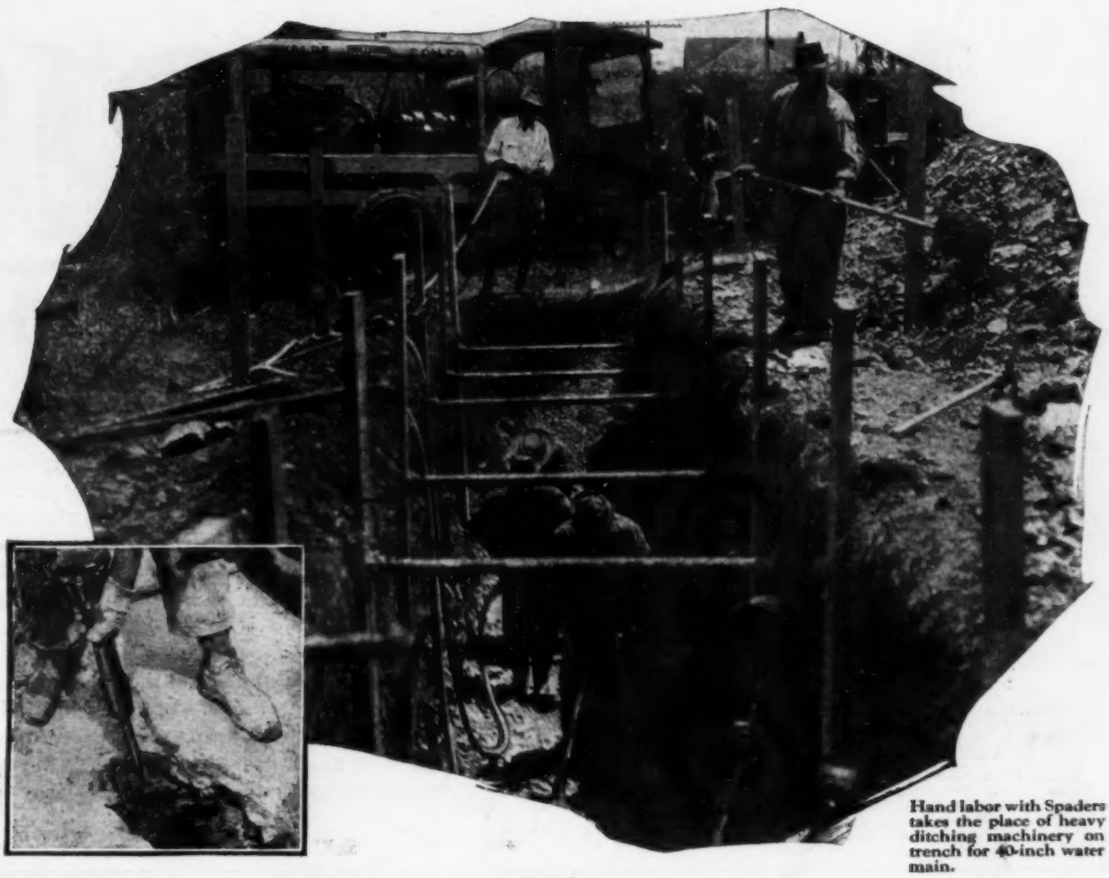
And these are only a few!

Be "In the Know." *Get our Catalog.*

SCHRAMM, INC.
West Chester, Pa.

Branches and representatives in all important cities.

Schramm



Ability of Spader to dig narrow trench saves pavement replacement costs.

Hand labor with Spaders takes the place of heavy ditching machinery on trench for 40-inch water main.

Bull point Spaders drive sewer tunnel rapidly in dry clay.

Save ½ the Labor on these Excavating Jobs

MANHOLES, Culverts, Narrow Pipe Trenches, Small Tunnels and Caissons. These and other excavating jobs hold real profits for contractors who use air Spaders.

One man and a Spader do the work of two men with picks and shovels. In cramped quarters, or in extra hard material, the saving in labor is even greater.

Spaders are powerful diggers, easy to handle; and they are adapted to any class of work. Twelve men with Spaders recently dug bridge footings 18x82x15 feet deep in blue clay, hardpan, and limestone, in 48 hours.

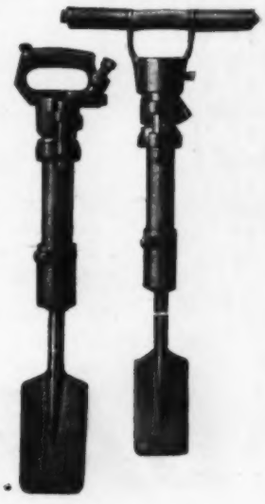
Spaders can be had with 4, 5, or 6-inch spades, or with bull points, asphalt cutters, or chisels.

They can be had with short shanks, or with long shanks and tee-handles to save the operator's back in open trench work.

Three different throttles are available. A 220-foot Vibrationless compressor will run six Spaders.

4600 yards of blue clay, hardpan, and limestone are excavated by Spaders for bridge footings. Spaders broke out the limestone, radially, from holes made with a Sullivan drill.

You will be interested in the new Spader Picture Book, 87-A.



S U L L I V A N
TRADE MARK

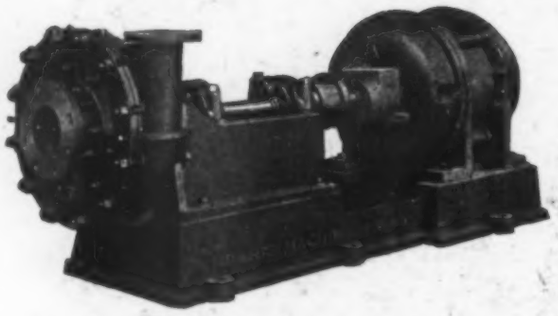
Air power equipment

SULLIVAN MACHINERY COMPANY

816 Wrigley Bldg., CHICAGO — 30 Church St., NEW YORK

MORRIS

CENTRIFUGAL PUMPS



Morris Machine Works, Baldwinsville, N. Y.

Originators of centrifugal pumps, both single and multi-stage, and builders for practically all purposes since 1864

Branch Offices:—New York, 225 W. 34th St.; Philadelphia, Witherspoon Bldg.; Cleveland, 1367 E. Sixth St.; Chicago, 228 N. LaSalle St.; Boston, 79 Milk St.; Pittsburgh, 320 Second Ave.; Detroit, Fisher Bldg.; Charlotte, N. C., Realty Bldg. Representatives in other industrial centers.

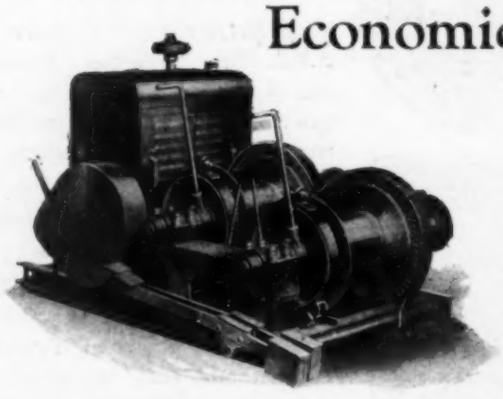
SOLIDS that scrape and scour have little effect on the tough, hard, wearing surfaces of Morris Sludge Pumps. Their design and construction are based on sixty-six years of experience in building centrifugal pumps for handling abrasive materials. These pumps operate efficiently with a lift on the suction side. All parts are massive to withstand heavy materials at high heads, and parts coming in contact with the material to be pumped are made of suitable metal to resist abrasive or corrosive action. Special provisions are made to take care of wear and permit maintenance of high initial efficiency. All these and many other special Morris features combine to assure low operating and maintenance cost and highly satisfactory service.

Send for Bulletin

HOISTS BUILT ESPECIALLY FOR CONTRACTORS

DAKE DAKE DAKE DAKE DAKE DAKE DAKE DAKE DAKE DAKE DAKE DAKE

Dake Hoists are Powerful, Dependable, Economical!



Tomorrow's profits come from today's decisions. Decide today to investigate the advantages and economies that come with the use of DAKE HOISTS.

Investigate DAKE arc-welded steel frames, steel drums, extra horse power per pound of weight, unusual portability and economical operation. Investigate the reasons why DAKE HOISTS pay such large profits per dollar invested.

Write today for the new DAKE catalog. Inform yourself about DAKE gasoline and electric hoists ranging from 2 to 27 h.p. and priced from $250.00 to $1,900.00 f.o.b. Factory.

DAKE ENGINE COMPANY Grand Haven Michigan

DAKE DAKE DAKE DAKE DAKE DAKE DAKE DAKE DAKE DAKE DAKE DAKE

TRADITION

PROGRESS

" 'BUILDINGS Going Up By Arc Welding' says a headline in my paper and they talk of a couple going up in the West and a couple in the East.

I'm beginning to wonder, Lad, how much there really is to this welding of buildings."

"Not nearly as much to it as in riveted construction, Pop.

Let me take that pencil and make a drawing for you comparing the design of a riveted beam seat and a welded one.

Both are designed for a load of 45,000 pounds.

The riveted seat requires 2 angle members and a filler plate, and to fabricate it you punch 4 pieces and drive 8 rivets.

The welded seat requires but one member . . . a piece of a T shape.

You fuse this into the column with 18 lineal inches of $\frac{3}{8}$" fillet weld.

So there's not as much in the arc-welded seat by 2 members and by a lot of labor.

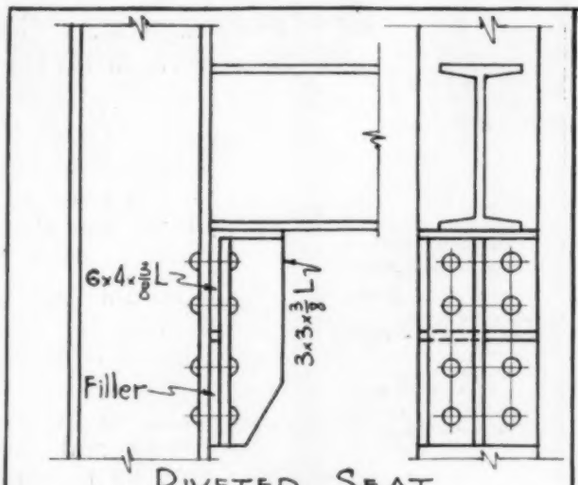
I got that from Lincoln's "Studies in Structural Arc Welding" which is a series of plates for architects, engineers and fabricators . . . mailed without charge to those with welding work under way, as well as those 'way under-worked in welding."

Write for a complete set of "Studies in Structural Arc Welding"

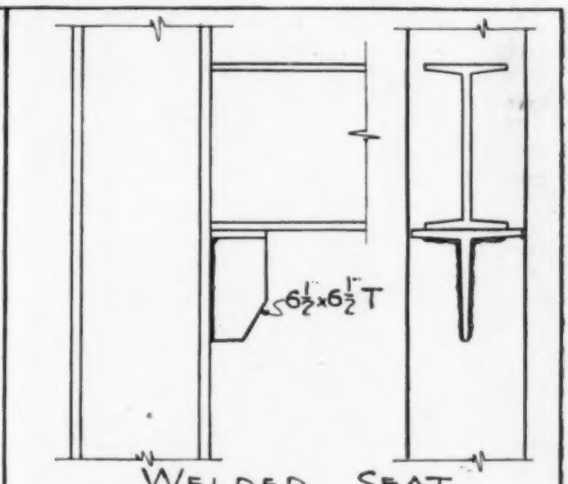
THE LINCOLN ELECTRIC COMPANY

Department No. 32-10 **Cleveland, Ohio**

World's Largest Manufacturers of Arc Welding Equipment W-160



RIVETED SEAT
FIGURE 1.



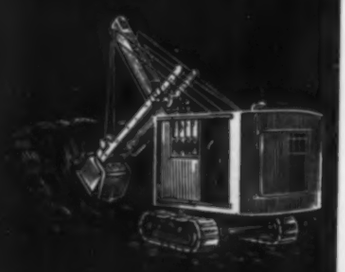
WELDED SEAT
FIGURE 2.

LINCOLN "Stable-Arc" WELDER

Lincoln "Stable-Arc" welder, motor-driven portable truck type, for use where electric power is available.

Light weight
with
great strength
due to
fewer parts
and all
steel construction

The
AMERICAN
GOPHER
Shovel
Crane
Dragline



Quality Engineering

AMERICAN
HOIST & DERRICK CO.
Saint Paul, Minnesota

CLEVELAND
H6

It Has Them

SPEED to rotate the steel. Power to blow the hole. Stamina to stand up under severe service. These are things you expect in a heavy drill.

Yet in spite of its light weight—32 pounds—the new Cleveland H6 Sinker has all of them.

Consider the reduction in costs when it is possible to use a light machine to do pop-holing and other drilling to depths of eight feet or more.

That is what you can do with a Cleveland H6. We will be glad to prove it by a demonstration. Write.

Specifications

Length overall 21½"
Weight 32 lb.
Bore and Stroke 2⅜" x 2¾"
Air Pressure Recommended: 70 to 80 lbs. gage
Two H6's can be run from a compressor of 100 to 120 cubic ft. capacity.

THE CLEVELAND ROCK DRILL CO.
3734 E. 78th St.,
Cleveland, Ohio

Distributors in 111 cities in the U. S. have parts in stock for immediate service.

CLEVELAND ROCK DRILLS

Low cost real estate development made possible with . . . .

GENUINE OPEN HEARTH IRON
TRADE GOHI MARK
PURE IRON - COPPER ALLOY
REG U.S. PAT. OFF.

(Meet copper-bearing pure iron requirements in all accepted specifications for corrugated metal culverts.)

Corrugated Culverts

GOHI Culverts are easy to handle and quick to install. No doubt about it. The three men shown placed 300 feet of 72-inch diameter culvert in 10 hours' time — 30 feet an hour.

The installation was a large real estate development. Time was a vital factor. Less than two hours after the culvert men got on the job, it was possible to begin back filling.

No lost motion. No idle equipment. No days of delay and waiting between the start and finish of the culvert installation.

Rapid, low cost installation . . . strength to withstand the weight of the heaviest tractor . . . flexibility to prevent breakage under the pressure of freezing water and settling earth fills . . . these are some of the advantages of GOHI Culverts — reasons why you should use GOHI for all highway drainage, and other culvert installations.

Made of Genuine Open Hearth Iron — pure iron-copper alloy — GOHI Culverts offer maximum resistance to corrosion . . . no one yet knows for how many years.

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Use GOHI Culverts for

- Highway Drainage
- Airports
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- Reservoir Syphons and Outlets

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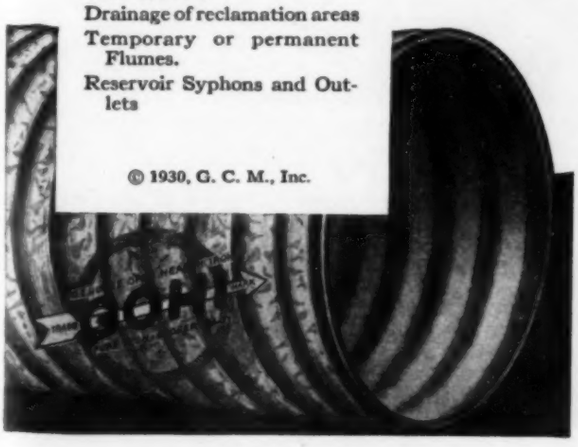

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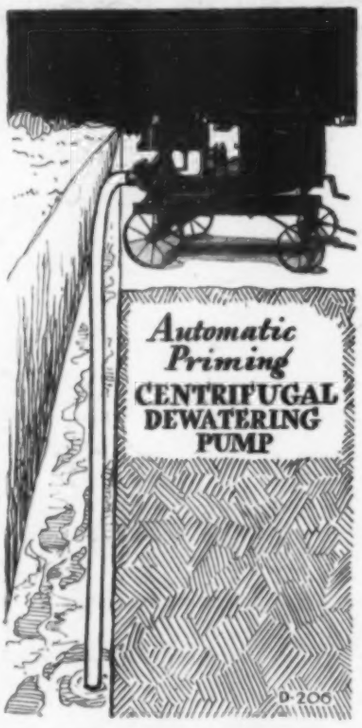

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Popular Sizes: 2½ in., 3 in., 4 in., and 6 in.

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Suction Lifts: Up to a maximum of 27 ft.

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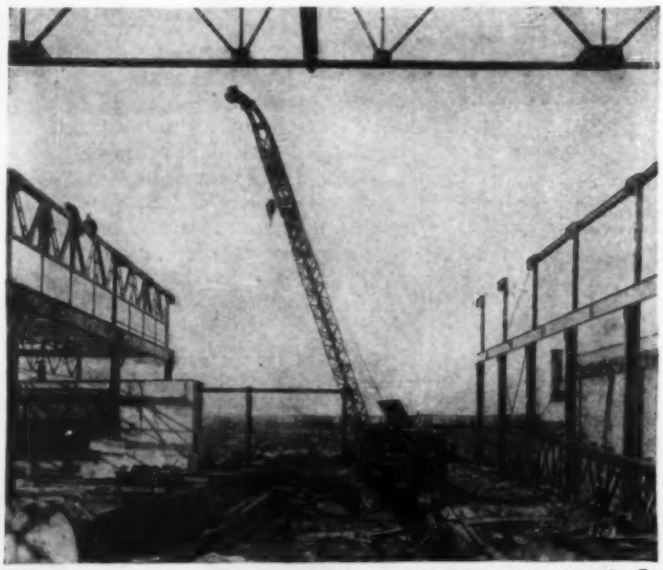
A Browning Crawler Crane on a Chicago construction job for C. H. Jenswold Steel Erecting Co.

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Cletrac Power Makes Jobs Move Faster, Cost Less

Let it Establish New Standards of Speed and Economy for You!

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Cletracs are built in a complete line which covers practically the entire range of tractor power requirements in both industry and agriculture — a size to meet every power need of outdoor work.

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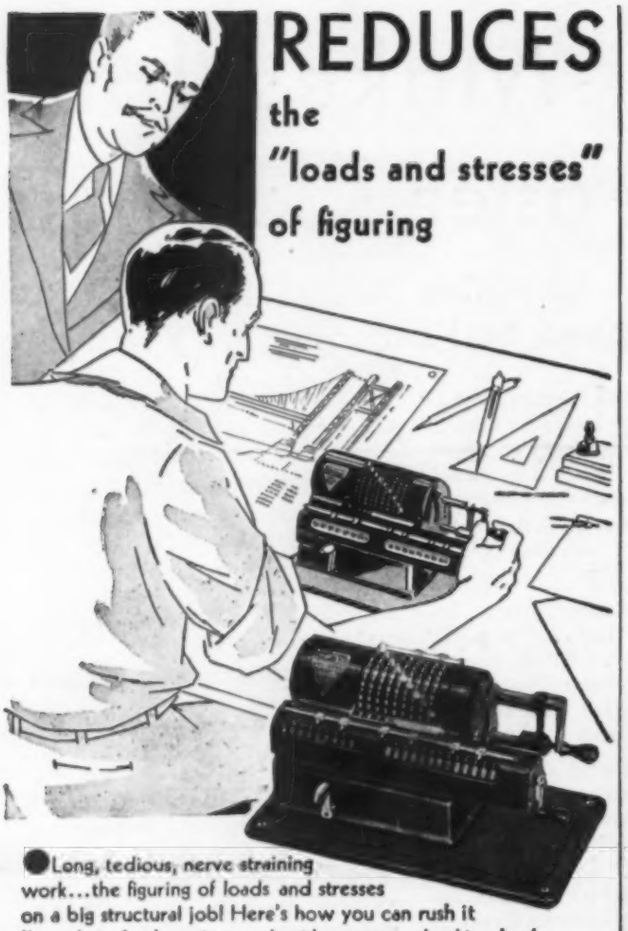
Crawler Tractors

Lower photo shows Cletrac 80-60 owned and operated by Summit County, Ohio.



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★ Self-lubricated axle bearings. No oiling needed. Wheels easier.

★ "V" shaped pressed steel tray braces. Greater rigidity. Can't twist.

FEATURES contributing to LOWER OPERATING COSTS

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★ "V" braced channel steel legs, riveted. Strength with light weight.

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★ Axle keyed to Malleable iron brackets. No nuts to loosen.

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★ Riveted double-cornered trays. Reinforcement for increased load tonnage.

★ Exact size and capacity trays. Interchangeable. Raises efficiency.

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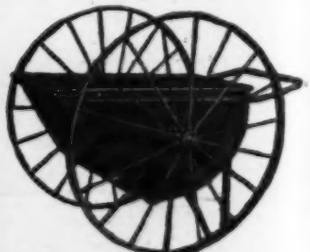

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Looking South on Fifth Avenue, New York, from 25th Street

WHERE TIME-SAVING COUNTS

■

The Cleveland Trinidad Paving Co.
Cleveland, O.

Branch FLUSHING, N.Y.

SEPT. 22nd 1930

Lone Star Cement Company New York Inc.,
342 Madison Avenue,
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Gentlemen:

In reply to your inquiry as to the use of your "Incor" high-early-strength Portland cement, in the re-paving of Fifth Avenue, from 14th Street to 42nd Street, in New York City.

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Without a material like "Incor" Cement, having high early strength, it would have taken weeks longer to complete a job of this nature where speed is of paramount importance.

Yours very truly

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Vice President

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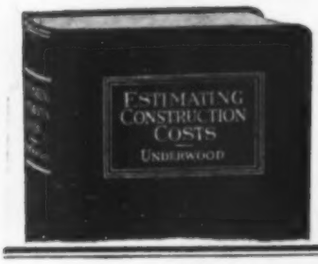
Just published!

A quick, simple chart system *for estimating construction costs*



Contractors—engineers — estimators—appraisers! Here is a new time and labor saving method of estimating construction costs. A glance at a chart takes the place of long and involved figuring in estimating labor and material costs for every branch of construction work. Simplifies and speeds up your estimating and makes it more accurate.

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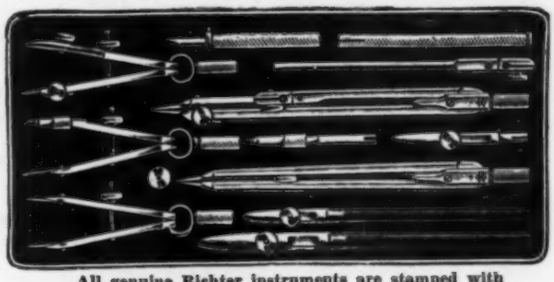

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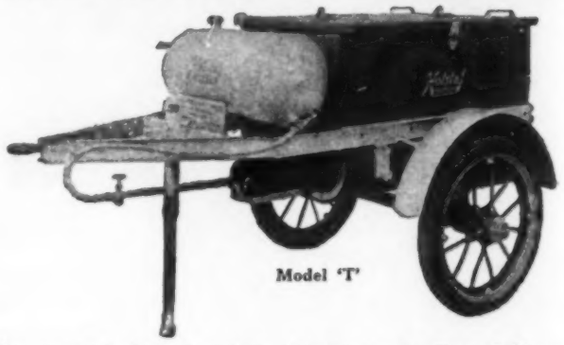

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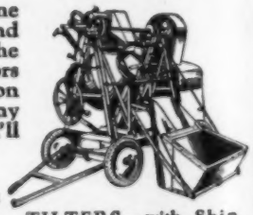

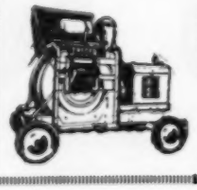

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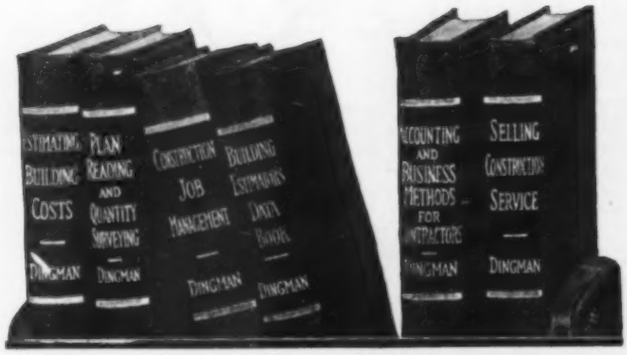

Make your costs come down and your profits go up!

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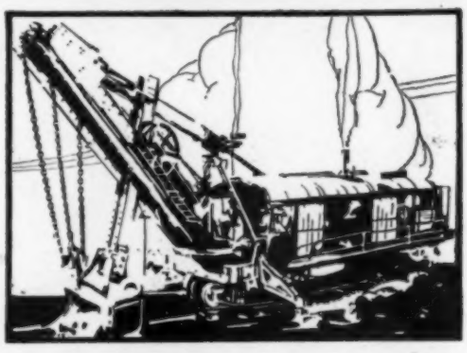

There's hardly a place on this shovel where Dixon's Waterproof Graphite Grease *won't ease severe service*

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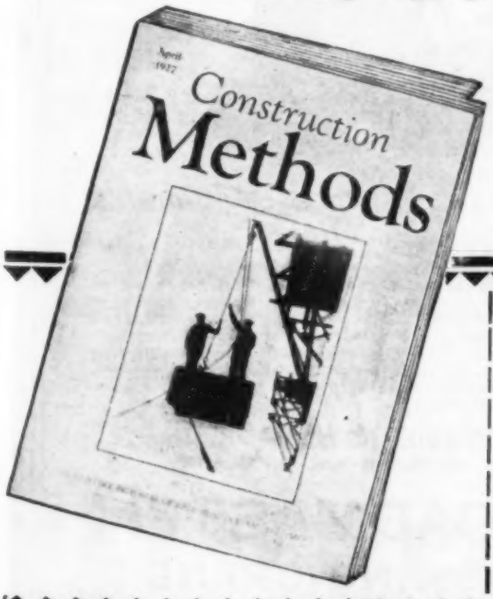

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CM-Ad-4

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On job after job these versatile steel derricks have proven their worth, demonstrating in time and money saved that it is costly to be without them on work for which they are adapted.

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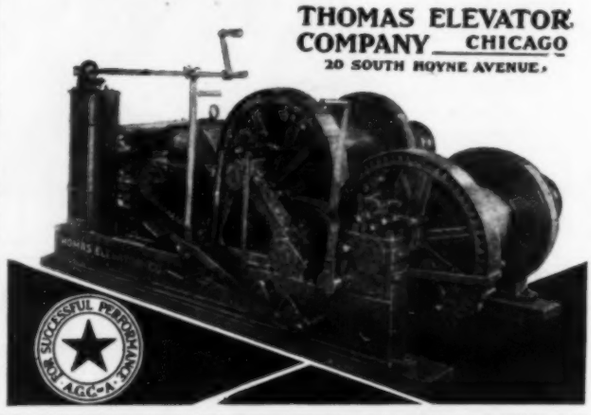

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SWING-CRANE

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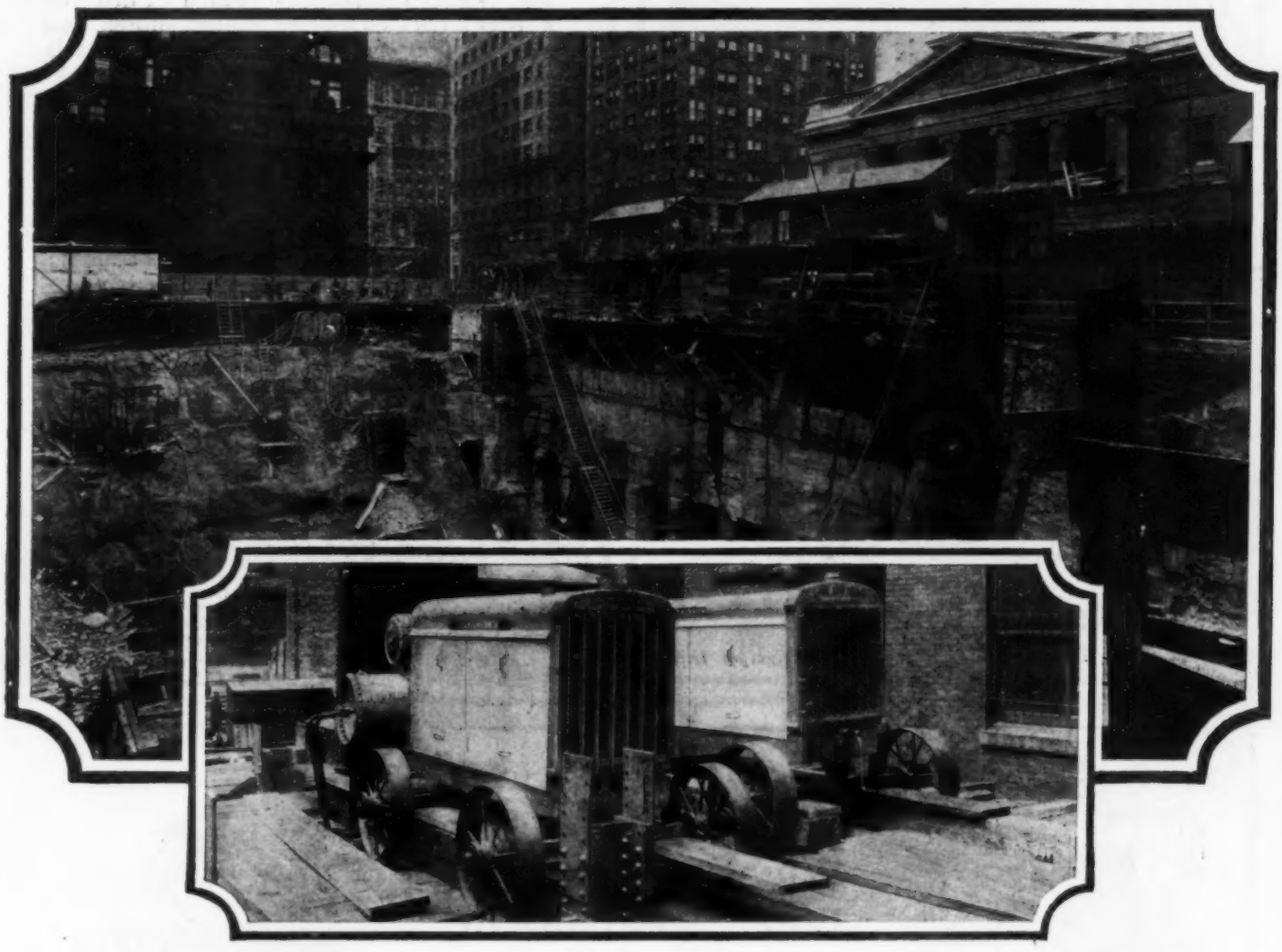

Time is an important factor in completing a big construction job. Machines and equipment that *save time* are the first choice of contractors and engineers alike. That is why Metalweld-Worthington "AIR KING" Portable Compressors were selected by T. Armstrong and Sons, contractors in charge of the excavation work on the new Liberty-Lincoln Building, Philadelphia. The American Bridge Company, who are in charge of the structural steel erection, also depend on "AIR KING" Portables to speed up their work, cut labor costs, and reduce operating expense.

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Portable Sawing Machine

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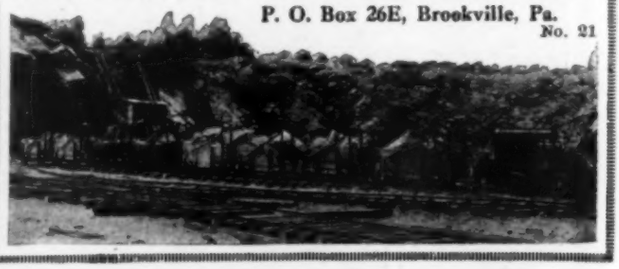

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Where you move or
How you move

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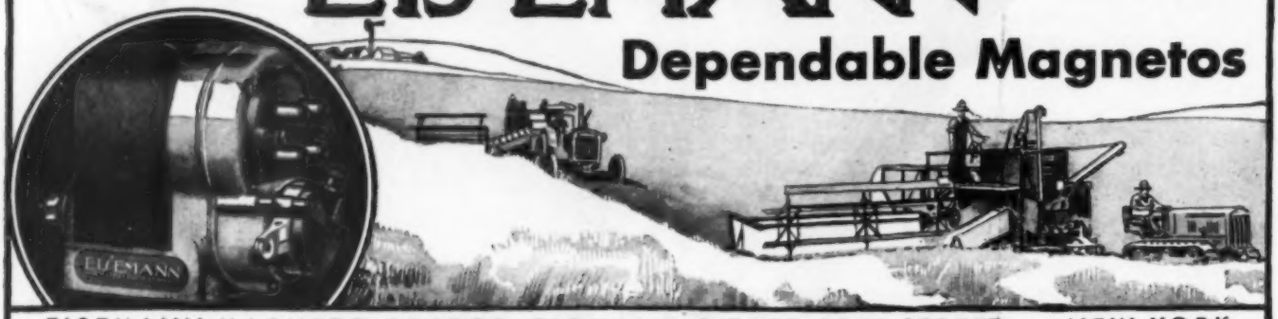

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DIG it with a new WILLIAMS "Champion"

Definitely guaranteed to outdig any bucket built.

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227

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They'll do more work than bare hands—they're more profitable.

Contractors and foremen are telling their men about Sabin's gloves. They're real gloves—warm and well made. Buffed elk-hide, hand and back. Grease and water won't hurt them—washable—have six inch canvas cuff and hold tight back.

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SABIN CO.—*Gloves*
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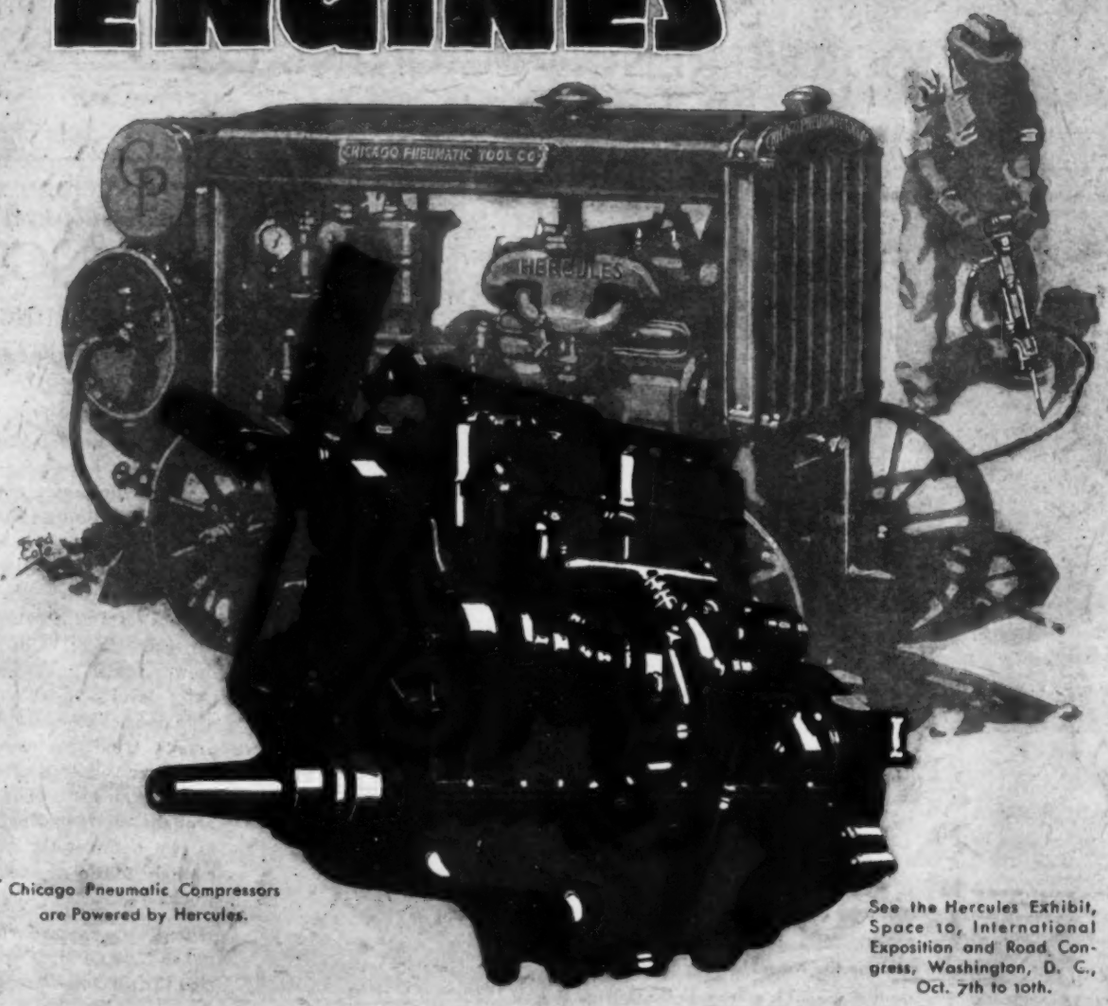

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The DEPENDABLE HUMDINGER

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The Searchlight Section

of this issue covers the current business wants of the industries in which this paper is read.

For Every Business Want
"*Think* SEARCHLIGHT *First*"

A Business Want—

must be satisfied by someone in your industry.

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Get Your Wants into the Searchlight

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Fall rope carriers set off mechanically. Roller bearing thruout. Designed for high speed with positive control. Powered by a double drum steam, electric or gasoline street hoist.

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